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TRANSACTIONS

OF THE

SOCIETY

OF

ARTS, MANUFACTURES, AND COMMERCE.

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TRANSACTIONS

OF THE

SOCIETY,

INSTITUTED AT LONDON,

FOR THE

ENCOURAGEMENT

OF

ARTS, MANUFACTURES, AND COMMERCE;

WITH THE

PREMIUMS offered in the Year 1806.

VOL. XXIV.

LONDON:

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Sold by the HOUSEKEEPER, at the SOCIETY'S HOUSE, in the ADELPHI; and by Messrs. ROBSON, J. WHITE, BECKET, JOHNSON, CADELL and DAVIES, PHILLIPS, WALTER, RICHARDSON, LONGMAN and REES, and TAYLOR.

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PREFACE.

THE present Volume of the Society's Transactions, though much smaller in appearance, will be found to contain more useful matter than many of their Volumes formerly published. The Committee of Correspondence and Papers being of opinion, that a smaller type and closer form would answer every desirable purpose, and at a less expence, have adopted the present plan, by which, a greater sum may be allotted for rewarding merit in different branches of Arts, Manufactures, and Commerce. Upon a similar principle, the Frontispiece to the Volume is omitted, and may perhaps, in future, be wholly relinquished, unless it is found necessary, from instances of great merit, to record the memory of such persons as may demand the particular attention of the Society, from having exerted themselves earnestly for its advantage; or to insert some exquisite work of art connected with its interest.

In several instances, where the objects of the Premiums offered during the last Session have been obtained, the offers for them are discontinued, and others introduced. Premiums are now offered, for the first time, for

the preparation of Hogs Bristles, equal to those imported from the Continent, and for the result of experiments to ascertain the proper Thickness of Wicks for Candles. Considerable alterations have taken place in the class of Polite Arts, and additional Premiums offered.

In the detail of the subjects contained in the present Volume, under the class of Agriculture, the Papers furnished by J. Christian Curwen, Esq. M. P. on the culture of Carrots, upon land heretofore thought unfavourable for the purpose; on a method of feeding Cows during the winter season, with a view to provide poor persons and children with milk at that time; and on a Weed Harrow of his invention, for breaking and loosening of stiff soils, to admit the power of extension to the roots of grain; show that Mr. Curwen's indefatigable exertions and success entitle him to the applause of the public.

From a long series of experiments on the comparative culture of Turnips by the Broad-cast and Drill methods, it has been proved that the advantage is uniformly in favour of the latter. The intelligent paper on the subject, by Charles Layton, Esq. of Reedham-hall, is another instance in point. Perhaps, nothing more was wanting to make this subject complete, than the introduction of a Horse-Hoe, well calculated to clear the intervals betwixt the rows, and to earth up the plants; such an implement has been produced by Mr. Charles Waistell,

Waistell, and will probably render the offer of further Premiums, for the culture of Turnips, unnecessary.

The Improvement of Waste or uncultivated Land creates a valuable addition to the public wealth. The experiments of Mr. Richard Phillips, of Tyn-y-Rhos, and of Mr. William Cheetham, of Mellor Moor, are striking examples of the good effects and advantages of such laudable industry.

In our uncertain climate farmers have frequently been prevented by bad weather, at the close of the autumnal season, from sowing their Wheat at that time, and great loss has consequently ensued to them; it has, of late years, been found by experience, that in such cases, Wheat, even of the common species, may be sown early in the Spring without great disadvantage to the crop; Mr. J. G. Calthrop has made extensive and lucrative trials in this line.

It is yet much to be desired, that some particular species of Wheat, of quicker growth, could be discovered and employed for the purpose.

The advantages arising to individuals, and the public, from the culture of Osiers, have been so clearly demonstrated for a series of years in the communications of the Society, that since the premium given to Mr. Shuckford Wade, noticed in this Volume, no further Premiums for their culture are offered.

The necessity of clearing the land at an early time after Turnips, for a succeeding crop of Wheat, has suggested a very ingenious hint for the preservation of them in Winter, communicated by Mr. James Dean, of Exeter.

The mischief and damages arising to plantations in general, from a bad system of pruning, or neglect, induced the late public-spirited Duke of Bedford, to direct a series of experiments to be made at his expence, by Mr. William Pontey, of Huddersfield, on his extensive plantations in the neighbourhood of Woburn. Mr. Pontey has shewn great industry and judgment in his selection of specimens, and in the clear detail relative to pruning Foreft Trees, which he has communicated in a publication, entitled the Forest Pruner, presented by him to the Society.

This system has been pursued by Mr. Salmon, agent to the present Duke of Bedford, under his Grace's auspices, and confirmed by his certificate, as noticed in the present volume. We are happy to add, it is continuing with spirit under his Grace's particular protection and attention.

The Plaster, invented by Mr. Charles Wilson, for preventing moisture exuding through it, or, as he terms it, his method of Curing Damp-Walls, is detailed under the Class of *Chemistry*, and, from various experiments made with it, appears effectually to answer the purpose.

Under

Under the Class of *Polite Arts*, the certificate furnished by so many Artists, of the first respectability in the united kingdom, on the good qualities of the Pannels, prepared by Mr. Sebastian Grandi, and also of his Oil and Colours, will doubtless convey to the public sufficient evidence of their merit.

In the Class of *Manufactures* will be seen an account of a very curious Loom, invented by Mr. John Austin, of Glasgow, the particular advantages of which are there fully described.

The Loom for Weaving Fishing-Nets, invented by Mr. J. Robertson, of Edinburgh, is a curious specimen of the powers of human ingenuity : its construction is well explained by the beautiful Plate annexed to its description, drawn by Mr. C. Varley, and engraved by Mr. Porter.

The Specimens of Cloth, produced by Mr. Wm. Neven, will, probably, be found of a finer fabric, than any heretofore woven in a Loom.

The Class of *Mechanics* displays, this year, a variety of useful and interesting Inventions.

At the desire of some Members of the Royal Humane Society, who had represented to the Society of Arts, &c. the necessity of a Drag, superior to any then known, for raising the Bodies of Persons sunk under Water, and the advantages which would probably arise to mankind, if the Society of Arts would give publicity to the measure ; the Society consented to such request, and a valuable reward

was offered. The proposal was attended with success, and the Drags invented by Dr. Thomas Cogan, of Bath, will be found to possess superior advantages over others which had been generally in use, and will, doubtless, be found serviceable in the cause of Humanity.

From Shoemakers being obliged, in the common method of making Boots or Shoes, to do a great part of their work in a sitting posture, with the shoe or boot pressing upon the stomach, very painful and fatal disorders have arisen. The Society had already rewarded two Machines, invented to obviate, in a considerable degree, these inconveniencies, when the superior merit of Mr. Stass's Machine, induced them to give also a reward to him.

The invention of a Circular Saw, by John Trotter, Esq. which obviates many difficulties and expences, which have long attended the operations of those who require curvilinear sawing in their trade, displays much ingenuity, and has been found a valuable acquisition in this department of business.

Perhaps no stronger instance can be shown of the obstinacy or thoughtlessness of mankind, in some cases, than in the use of two Screws in the construction of the Bookbinders Press, for many centuries, and until the present invention by Mr. Hardie. One Screw is now found to answer the purpose effectually.

Mr. Neil Snodgrass has been rewarded for a method of

Heating

Heating Rooms or Factories by Steam-Pipes, conducted through the different chambers of the building, and arranged with such judgment that one fire will communicate sufficient heat to an extensive range of apartments.

Mr. George Field has invented a Stove, which possesses the united powers of heating rooms, supplying them with fresh air, and of drying the sundry articles, placed in its different compartments.

A Machine invented by Mr. Benjamin Stott, has been hitherto principally employed in preparing Sheep-skins for Parchment or Leather, by dividing the thickness of the skin into two parts or folds, one of which makes a perfect skin, equal throughout; the other an inferior skin, but of much more value than the parings or shreds, into which it had been formerly shaved. The principle will equally apply to other Skins.

Mr. John Middleton's Machines for Printing Paper-Hangings, execute the business with much neatness and dispatch; and from the great pressure which he can apply by his Lever to the Printing-block, the colour will be more equally pressed into the paper, where a large body of colour is required, than can be done with the common Lever.

Mr. Davis has endeavoured to prevent the accidents which frequently happen to Glaziers or Painters employed at the outsides of windows; the Machine of his invention when properly employed, is firm and secure, and will cause no injury to the wainscot or paint within the room.

In

In the Class of *Colonies and Trade* the communications from Dr. William Roxburgh, of Calcutta, relative to the products of the East Indies, will be found highly interesting: they contain, in addition to a paper given by him in the 22d volume of the Society's Transactions, farther observations on the culture, properties, and comparative strength of Hemp, and other vegetable fibres; remarks on the annual growth of various trees; and explanations relative to specimens of different articles which he has presented to the Society.

The accounts furnished by Mess. Wright, Arnold, Cornwall, and Ward, of Canada, evince that the culture of Hemp in Canada continues to meet with attention, and is likely, in time, to form a valuable article of commerce with the united empire.

Besides the rewards conferred by the Society, noticed under the several classes mentioned in the body of the present volume, it will be found at page 18, that considerable rewards have been conferred in the Class of Polite Arts, on her Serene Highness the Margravine of Anspach, and other Ladies there mentioned, also on several very deserving Artists. The performances produced the last Session in this Class were superior to those of former years; and the Committee superintended the execution of specimens, in Painting and Drawing, by the several candidates, in the rooms of the Society, in order to obviate deception.

The Society take the present opportunity to return their

their thanks to the several Public Bodies and individuals who have favoured them with Presents, the particulars of which are noticed in page 165.

The Library of the Society has received some valuable additions; and it is a desirable object for a body whose views are directed to improvements in the Arts, Manufactures, and Commerce of the united empire, to obtain as many treatises as possible conducive to that end.

The Society desire it to be clearly understood, that as a body they are not responsible for any opinion or representation of facts contained in the following pages. They have endeavoured only to compress, into a form more concise, such accounts as appeared to them too diffuse when received.

The Rewards bestowed by the Society during the last Session, amounted to a very considerable sum; and great pains have been taken by the several Committees to investigate minutely the merits of the inventions referred to them.

A regular routine of business established by the Society, prevents any claims from being precipitately passed; and allows the merit of the humblest candidate for reward to be as well considered as that of the most dignified claimant.

Without parliamentary assistance, or landed property, this Society continues to flourish under the exertions of its independent members; from them its revenues are derived.

The additional members elected during the last Session were one hundred and forty-two.

Probably

Probably no Society in the world affords so many advantages to its members, in respect to conveying knowledge and instruction in the several objects it comprehends: these are not merely confined to the articles particularized in the printed list of Premiums offered, but extend to general improvements in the Arts, Manufactures, and Commerce, of the united empire.

Adelphi, London,
Dec. 10, 1806.

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PREMIUMS offered by the SOCIETY, *instituted at* London, *for the Encouragement of Arts, Manufactures, and Commerce, for the Year* 1806.

TO THE PUBLIC.

THE chief objects of the SOCIETY are to promote the Arts, Manufactures, and Commerce of this kingdom, by giving rewards for all such useful Inventions, Discoveries, and Improvements (though not mentioned in this book), as tend to that purpose; and, in pursuance of this plan, the SOCIETY have already expended many THOUSAND POUNDS, advanced by voluntary subscriptions of their members, and legacies bequeathed.

The Register of the Premiums and Bounties they have given, which may be seen at the SOCIETY'S HOUSE in the *Adelphi*, will show the very great advantages which the Public have derived from this Institution.

The meetings of the SOCIETY are held every *Wednesday*, at seven o'clock in the evening, from the fourth *Wednesday* in *October* to the first *Wednesday* in *June*. The several Committees meet on other evenings in the week during the session.

In order still farther to promote the laudable views of this SOCIETY, it may be necessary to explain the mode by which its members are elected.

Each member has the privilege, at the meetings of the SOCIETY, of proposing any person who is desirous to become a member, provided the proposal containing the name, with the addition and place of abode of the proposed member, is signed by three members of the SOCIETY.

Peers of the Realm or Lords of Parliament are, on their being proposed, immediately balloted for; and the name of every other person proposing to become a member, is to be delivered to the Secretary, who is to read the same, and insert the name, &c. in a list, which is to be hung up in the SOCIETY'S room until the next meeting: at which time such person shall be balloted for; and, if two thirds of the members, then voting, ballot in his favour, he shall be deemed a *perpetual member*, upon payment of not less than *Twenty Guineas* at one time; or, a *subscribing member*, upon payment of any sum not less than *Two Guineas* annually.

Every member is entitled to vote, and assist in all the transactions of the SOCIETY, and its several Committees. He has also the privilege of recommending two persons as Auditors, at the meetings of the SOCIETY; and, by addressing a note to the Housekeeper, of introducing his friends to examine the various models, machines, and productions, in different branches of arts, manufactures, and commerce, for which rewards have been bestowed; and to inspect the magnificent series of moral and historical paintings, executed by the late JAMES BARRY, Esq. which, with some valuable busts and statues, decorate the Great Room. He has likewise the use of the Library; and is entitled to the annual Volume of the SOCIETY'S Transactions.

The time appointed for admission to the paintings or models, is from ten to two o'clock, Sundays and Wednesdays excepted.

PREMIUMS IN AGRICULTURE.

Article 1. ACORNS.

FOR having set, between the first of October, 1804, and the first of April, 1805, the greatest quantity of land, not less than ten acres, with acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

2. For the second greatest quantity of land, not less than five acres, set agreeably to the above conditions, the silver medal.

Certificates of setting agreeably to the above conditions, and that there are not fewer than three hundred young oaks on each acre, to be delivered to the Society on or before the first Tuesday in December, 1806.

3. RAISING OAKS. To the person who shall have raised, since the year 1802, the greatest number of oaks, not fewer than five thousand, either from young plants or acorns, in order to secure a succession of oak timber in this kingdom; the gold medal.

4. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates that there were on the land, at least the number of young oak-trees required, in a thriving condition, two years after the planting, with an account of the methods pursued in making and managing the plantation, to be produced to the Society on or before the first Tuesday in January, 1807.

5. ASCERTAINING THE BEST METHOD OF RAISING OAKS. To the person who shall ascertain in the best manner, by actual experiments, the comparative merits of the different modes of raising oaks for timber, either from acorns set on land properly dug or filled, from acorns set by the spade or dibble, without digging or tillage, either on a smooth surface, or among bushes, fern, or other cover; or from young plants, previously raised in nurseries, and transplanted; regard being had to the expense, growth, and other respective advantages of the several methods; the gold medal.

The *accounts*, and proper *certificates* that not less than one acre has been cultivated in each mode, to be produced to the Society on or before the first Tuesday in November, 1806.

6. CHESNUTS. For having sown or set, between the first of October, 1804, and the first of April, 1805, the greatest quantity of land, not less than six acres, with Spanish chesnuts, with or without seeds, cuttings, or plants of other trees, adapted to such soil, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

7. For the second greatest quantity, not less than four acres, the silver medal.

Certificates of sowing or setting, agreeably to the above conditions, and that there are not fewer than three hundred chesnut plants, in a thriving state, on each acre, to be delivered to the Society on or before the first Tuesday in January, 1807.

8. ELM. For having planted the greatest number of the English elm, not less than eight thousand, between the twenty-fourth of June, 1804, and the twenty-fourth of June, 1805; and for having effectually fenced and preserved the same in order to raise timber; the gold medal.

9. For the second greatest number, not less than five thousand, the silver medal.

Certificates of having planted agreeably to the above conditions, that the plants were in a healthy and thriving state two years at least after making the plantation, and specifying the distance of the plants, to be delivered to the Society on or before the first Tuesday in April, 1807.

10. LARCH. For having planted out, between the twenty-fourth of June, 1803, and the twenty-fourth of June, 1804, the greatest number of larch-trees, not fewer than five thousand, and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

11. For the next greatest number, not fewer than three thousand, the silver medal.

Certificates of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the last Tuesday in December, 1806.

N.B. The larch-trees may be planted, either mixed with other trees, or by themselves, as may best suit the convenience of the planter.

12. ASH. For having sown or set, in the year 1803, the greatest quantity of land, not less than six acres, with ash for timber, with or without seeds, cuttings, or plants, of such other trees as are adapted to the soil; the gold medal.

13. For the next greatest quantity, not less than four acres, the silver medal.

Certificates of the sowing or setting, agreeably to the above conditions, that there are not fewer than one hundred ash plants on each acre, in a thriving and healthy condition, two years at least after the sowing or setting, with a general account of the methods used in making the plantation; to be delivered to the Society on or before the last Tuesday in December, 1806.

N. B. *It is the intention of the Society, that such lands only as are not calculated for the purposes of Husbandry, should be employed for the purposes specified in these advertisements.*

14. FOREST-TREES To the person who shall have enclosed and planted, or set, the greatest number of acres (not less than ten) of land, that is incapable of being ploughed, such as the borders of rivers, the sides of precipices, and any land that has too many rocks, or that is not calculated to repay the expense of tillage, owing to the surface being too hilly, mountainous, or otherwise unfit for tillage, with the best sorts of forest-trees, namely, oak, Spanish chesnuts, ash, elm, beech, alder, willow, larch, spruce, and silver fir, with or without screens of Scotch fir, adapted to the soil, and intended for timber-trees, between the first of October, 1803, and the first of April, 1804; the gold medal.

15. For the second greatest quantity of land, not less than seven acres; the silver medal.

A particular *account* of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper *certificates* that they were in a healthy and thriving state two years at least after making the plantation, to be delivered to the Society on or before the first Tuesday in December, 1806.

N. B. With the above forest trees, the seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

The candidates for planting all kinds of trees are to produce certificates that the respective plantations are properly fenced and secured, and

particularly to state the condition of the plants at the time of signing such certificates. Any information which the candidates for the foregoing premiums may choose to communicate, relative to the methods made use of in forming the plantations, or promoting the growth of the several trees, or any other observations that may have occurred on the subject, will be thankfully received.

16. Securing Plantations of Timber-trees, and Hedge-rows. To the person who shall give to the Society the most satisfactory account, founded on experience, of the most effectual and least expensive method of securing young plantations of timber-trees, and hedge-rows, from hares and rabbits, as well as sheep and larger cattle, which at the same time shall be least subject to the depredations of wood-stealers; the silver medal. The *accounts*, and *certificates* of the efficacy of the method, to be produced to the Society on or before the first Tuesday in December, 1806.

17. Comparative Culture of Wheat broad-cast, drilled, and dibbled. For the best set of experiments, made on not less than twelve acres, four of which to be sown broad-cast, four drilled, and four dibbled, the two latter in equidistant rows, in order fully to ascertain which is the most advantageous mode of cultivating wheat; the gold medal. It is required that every operation and expense of each mode of culture be fully described; and that proper *certificates* of the nature and condition of the land on which the experiments were made, together with an *account* of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the first Tuesday in February, 1807.

18. Beans and Wheat. To the person who shall have dibbled or drilled, between the 1st of December, 1805, and the 1st of April, 1806, the greatest quantity of land, not less than ten acres, with beans, in equidistant rows, and hoed the intervals twice or oftener, and shall have sown the same land with wheat in the autumn of the year 1806; the gold medal. It is required that an *account* of the sort and quantity of beans, the time of dibbling or drilling, and of reaping or mowing them, the produce per acre thrashed, the expense of dibbling or drilling, hand or horse hoeing, the distance of the rows, and the quality of the soil, together with *certificates* of the number of acres, and that the land was afterwards actually sown with wheat, be produced on or before the second Tuesday in March, 1807.

19. Beans. To the person who, in the year 1805, shall discover and cultivate, either by the drill or dibbling method, on not less than five acres, a species of horse-beans or tick-beans, that will ripen their seeds before the 21st of August; the silver medal. It is required that a particular account of the bean, the cultivation, and the expense attending it, with proper *certificates* of the nature and condition of the land on which the experiments were made, together with an *account* of the produce, the weight per Winchester bushel, and a sample of not less than a peck, be produced to the Society on or before the first Tuesday in December, 1806. It is apprehended that, if a bean should be brought into cultivation with the habits of the hotspur, or other early peas, that it would, in a great measure, escape the danger arising from the collier-insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat. The *accounts* and *certificates* to be delivered on or before the first Tuesday in December, 1806.

20. Parsnips To the person, who in the year 1806, shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the sole purpose of feeding cattle or sheep; the gold medal

Certificates of the quantity of land so cultivated, with a particular *account* of the nature of the soil and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the parsnips, and the advantages resulting from the practice, to be produced to the Society on or before the second Tuesday in February, 1807.

21. Buck Wheat. To the person who shall cultivate the greatest quantity of land with buck wheat, not less than thirty acres; the gold medal.

It is required that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, the manner of reaping it, thrashing it, and housing the grain; with proper *certificates* of the nature and condition of the land on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding year, together with an *account* of the produce, and a sample of the seed, not less than a quart, be produced to the Society on or before the second Tuesday in January, 1807.

22. For the next greatest quantity, not less than fifteen acres, on similar conditions; the silver medal.

Information respecting its application to the feeding of cattle, hogs, and poultry, and other of its uses, is also desired. It is known to be particularly serviceable in furnishing honey to bees.

23. Raising Grass Seeds. To the person who shall raise the greatest quantity of each of any of the following named grass

seeds, *viz.*---Meadow fox-tail (alopecurus pratensis), sweet-scented vernal grass (anthoxanthum odoratum), Timothy grass (phleum pratense), meadow fescue grass (festuca pratensis), smooth-stalked meadow grass (poa pratensis), rough-stalked meadow grass (poa trivialis); the silver medal. It is required that *certificates* from persons who have viewed them in a proper state, to identify that they are one or other of the seeds above mentioned, indicating clearly the particular species, and noticing the quantity produced of such seeds, free from weeds or mixture of other grasses, together with proper samples of the seeds, be produced to the society on or before the 1st day of February, 1807.

24. Preserving Turnips. To the person who shall discover to the Society the best and cheapest method of preserving turnips perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle, during the months of February, March, and April; the gold medal. It is required that a full and accurate *account* of the method employed, and the expense attending the process, together with *certificates* that the produce of four acres at the least have been preserved according to the method described, and applied to the feeding of sheep and neat cattle; that the whole were drawn out of the ground before the first day of February, in order to clear the greater part of it previous to its being prepared for corn, and to save the soil from being exhausted by the turnips; and also of the weight of an average sixteen perches of the crop; be produced to the Society on or before the first Tuesday in December, 1806.

25. For the next in quantity and merit, on not less than two acres, the silver medal.

26. Preserving Cabbages. To the person who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

27. For the next in quantity and merit, on not less than two acres, the silver medal. Conditions the same as for preserving turnips, Art. 24. And the *accounts* to be produced on or before the first Tuesday in December, 1806.

28. Preserving Carrots, Parsnips, or Beets. To the person who shall discover to the Society the best and cheapest method of preserving carrots, parsnips, or beets, perfectly sound, and in every respect fit for the purpose of supporting horses, and fattening sheep and neat cattle, during the months of February, March, and April; the gold medal. Conditions the same as for preserving turnips, Art. 24. And the *accounts* to be delivered in on or before the first Tuesday in December, 1806.

29. For the next in quantity and merit, on not less than two acres, the silver medal.

30. Preserving Potatoes. To the person who shall discover to the Society the best and cheapest method of preserving potatoes, two or more years, perfectly sound, without vegetating, and in every other respect fit for the purpose of sets and the use of the table, and, consequently, of supporting and fattening cattle; the gold medal, or thirty guineas. It is required, that a full and accurate *account* of the method employed, and the expense attending the process, with *certificates* that one hundred bushels at the least have been preserved according to the method described, and that one or more bushels of the same potatoes have been set, and produced a crop without any apparent diminution of their vegetative power, and also that they have been used at table, with entire satisfaction to the person who eat of them, together with a sample of one bushel, be sent to the Society on or before the first Tuesday in December, 1806.

31. For the next greatest quantity, not less than fifty bushels, the silver medal.

32. Making Meadow-Hay in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of making meadow-hay in wet weather; the gold medal, or thirty guineas A full *account* of the method employed, and of the expense attending the process, with not less than fifty-six pounds of the hay; and *certificates* that at least the produce of six acres of land has been made according to the method described, and that the whole is of equal quality with the sample; to be produced on or before the first Tuesday in January, 1807.

33. Harvesting Corn in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet weather; the gold medal, or thirty guineas. A full *account* of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and *certificates* that at least the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples, to be produced on or before the first Tuesday in January, 1807.

34 Gaining Land from the Sea. To the person who shall produce to the Society an account, verified by actual experiment, of his having gained the greatest quantity of land from the sea, not less than fifty acres, on the coast of Great Britain or Ireland; the

gold medal. *Certificates* of the quantity of land, and that the experiments were begun after the 1st of January, 1800, to be produced to the Society on or before the last Tuesday in November, 1806.

35. The same premium is extended one year farther. *Certificates* to be produced on or before the last Tuesday in November, 1807.

36. Improving Land lying waste. For the most satisfactory *account* of the best method of improving any of the following soils, being land lying waste or uncultivated, *viz.* clay, gravel, sand, chalk, peat-earth and bog, verified by experiments on not less than fifty acres of land, the gold medal, or thirty guineas.

37. For the next greatest quantity, not less than thirty acres, the silver medal, or twenty guineas.

It is required, that the land, before such improvement, be absolutely uncultivated, and in a great measure useless, and that, in its improved state, it be enclosed, cultivated, and divided into closes.

Certificates of the number of acres, of the quality of the land so improved, with a full *account* of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced on or before the first Tuesday in February, 1807.

38. Manures. For the most satisfactory set of experiments, to ascertain the comparative advantages of the following manures, used as top-dressings on grass and corn land, *viz* soot, coal-ashes, wood-ashes, lime, gypsum, night soil, or any other fit article; the gold medal, or the silver medal and ten guineas. It is required that the above experiments be made between two or more of the above-mentioned manures, and that no less than two acres of land be dressed with each manure. An *account* of the nature of the soil, quantity and expense of the manure and crops, with *certificates*, to be produced on or before the last Tuesday in February, 1807.

39. Raising Water for the Irrigation of Land. To the person who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for the purpose of irrigating land, superior to, and cheaper than any other method now in use; the gold medal, or fifty guineas. A model on a scale of one inch to a foot, with *certificates* that a machine at large, on the same construction, has been used, specifying the quantity of water delivered in gallons per hour, and the height to which it was raised, to be produced to the Society on or before the first of March, 1807.

40. Paring Plough. To the person who shall invent and produce to the Society, a machine or plough for the purpose of paring land preparatory to burning, superior to any hitherto known or in use for such purpose, and to be worked by not more than one man and two horses; the silver medal, or twenty guineas. The machine, and *certificates* that at least three acres have been pared by it in a proper manner, to be produced to the Society on or before the first of January, 1807.

41. Machine for Dibbling Wheat. To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances and proper depths; the silver medal and ten guineas. The *machine*, with *certificates* that at least three acres have been dibbled by it, to be produced to the Society on or before the second Tuesday in January, 1807.

42. Machine for Reaping or Mowing Corn. For inventing a machine to answer the purpose of mowing or reaping wheat, rye, barley, oats, or beans, by which it may be done more expeditiously and cheaper than by any method now practised, provided it does not shed the corn or pulse more than the methods in common practice, and that it lays the straw in such a manner that it may be easily gathered up for binding; the gold medal, or thirty guineas. The *machine*, with *certificates* that at least three acres have been cut by it, to be produced to the Society on or before the second Tuesday in December, 1806. Simplicity and cheapness in the construction of this and the preceding machine, will be considered as principal parts of their merit.

43. Thrashing Machine. To the person who shall invent a machine by which corn of all sorts may be thrashed more expeditiously, effectually, and at a less expense, than by any method now in use; the gold medal, or thirty guineas The *machine*, or a model, with proper *certificates* that such a machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1807.

44. Destroying the Grub of the Cockchafer. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying the grub of the cockchafer, or of preventing or checking the destructive effects which always attend corn, peas, beans, and turnips, when attacked by those insects; the gold medal, or thirty guineas The *accounts*, with proper *certificates*, to be produced on or before the first Tuesday in January, 1807.

45. Destroying Worms. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying worms or of preventing the destructive effects they occasion on corn, beans, peas, or other pulse; the silver medal, or ten guineas. The *accounts*, with proper *certificates* to be produced to the Society on or before the first Tuesday in January, 1807.

46. Destroying the Fly on Hops. To the person who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known or practised, on not less than four acres of hop ground; the gold medal, or thirty guineas. *Accounts* and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1807.

47. Preventing the Blight, or Ravages of Insects, on Fruit-Trees and Culinary Plants. To the person who shall discover to the Society the most effectual method of preventing the blight or ravages of insects on fruit-trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments; the silver medal, or ten guineas. The *accounts*, with proper *certificates*, to be delivered to the Society on or before the second Tuesday in December, 1806.

48. Cure of the Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments; the gold medal, or fifty guineas. It is expected that the candidates furnish accurate *accounts* of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper *certificates*, must be delivered to the Society on or before the first Tuesday in February, 1807.

49. Cure of the Foot-Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the foot-rot in sheep; the silver medal, or ten guineas. It is required that the cure be ascertained by repeated and satisfactory experiments, and the method of performing it be verified by proper *certificates* delivered to the Society on or before the first Tuesday in February, 1807.

50. Preventing the ill Effects of Flies on Sheep. To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies; the silver medal, or ten guineas. It is required, that the method be ascertained by repeated experiments, and that a *certificate* of its efficacy be delivered to the Society on or before the first Tuesday in December, 1806.

51. Protecting Sheep. To the person who, in the year 1805, shall protect the greatest number of sheep, not fewer than one hundred, by hovels, sheds, or any other means, and give the most satisfactory account, verified by experiment, of the advantages arising from the practice of protecting sheep from the inclemency of the weather, by hovels, sheds, or any other means; the silver medal, or ten guineas. A particular *account* of the experiments made, with the advantages arising therefrom, together with the expense, and *certificates* of its utility, to be produced to the Society on or before the first Tuesday in March, 1807.

N. B. It is required that the *certificates* shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time; together with the general method of managing them.

52. Culture of Hemp in certain parts of Scotland. The Society wishing to encourage the growth of hemp for the use of the navy in certain parts of Scotland, comprehending the whole county of Argyle, that part of Perthshire situated to the north of the river Tay, and west of the Military Road (see Ainslie's Map of Scotland) leading from Logierait to the county of Inverness, and such other parts of Scotland as lie north of Inverness-shire, offers to the person who shall sow with hemp, in drills at least eighteen inches asunder, the greatest quantity of land in the above-mentioned district, not less than fifty acres statute measure, in the year 1806, and shall at the proper season cause to be plucked the summer hemp (or male hemp bearing no seed), and continue the winter-hemp (or female hemp bearing seed) on the ground until the seed is ripe; the gold medal, or fifty guineas.

53. To the person who shall sow with hemp, in drills at least eighteen inches asunder, the next greatest quantity of land in the above-mentioned district, not less than twenty-five acres, statute measure, in the year 1806, and shall at the proper season cause the same to be plucked as above-mentioned; the silver medal, or twenty-five guineas. *Certificates* of the number of acres, of the distance of the drills, of the plucking of the hemp, with a general *account* of the soil, cultivation, and produce, to be delivered to the Society, along with fourteen pounds of the hemp and two quarts of the seed, on or before the second Tuesday in January, 1807.

PREMIUMS FOR DISCOVERIES AND IMPROVEMENTS IN CHEMISTRY, DYEING, AND MINERALOGY.

54. Preserving Seeds of Vegetables. For the best method of preserving the seeds of plants in a state fit for vegetation a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the first Tuesday in December, 1806; the gold medal, or thirty guineas.

55. Preventing the Dry rot in Timber. To the person who shall discover to the Society the cause of the dry-rot in timber, and disclose a certain method of prevention superior to any hitherto known; the gold medal, or thirty guineas. The *accounts* of the cause, and method of prevention, confirmed by repeated experiments, to be produced to the Society on or before the second Tuesday in December, 1806.

56. Preserving salted Provisions from becoming rancid or rusty. To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from growing rancid or rusty; the gold medal, or thirty guineas. A full *description* of the method, with proper *certificates* that it has been found, on repeated trials, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1807.

57. Refining Whale or Seal Oil. For disclosing to the Society an effectual method of purifying whale or seal oil from the glutinous matter that incrusts the wicks of lamps, and extinguishes the light, though fully supplied with oil; the gold medal, or fifty guineas. It is required, that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society to determine the validity of the claim; and *certificates* that not less than twenty gallons have been purified according to the process delivered in, together with two gallons of the oil, in its unpurified state, and two gallons so refined, to be produced to the Society, on or before the second Tuesday in February, 1807.

58. Manufacturing Tallow Candles. To the person who shall discover to the Society a method of hardening or otherwise preparing tallow, so that candles may be made of it which will burn as clear and with as small a wick as wax candles, without running, and may be afforded at a less expense than any at present made with spermaceti; the gold medal, or thirty guineas. *Certificates* that 112lb. of such tallow have been made into candles, and 12lb. of the candles made thereof, to be produced to the Society on or before the second Tuesday in January, 1807.

59. Candles from Resin or other Substances. To the person who shall discover to the Society the best method of making candles of resin, or any other substance, fit for common use, at a price much inferior to those made of tallow only; the gold medal, or thirty guineas. Six pounds at least of the candles so prepared, with an *account* of the process, to be delivered to the Society on or before the first Tuesday in December, 1806.

60. Method of separating Sugar in a solid Form from Treacle. To the person who shall discover to the Society the best method of separating sugar from treacle, in a solid form, at such an expense as will render it advantageous to the public; the gold medal, or fifty guineas. A quantity of the sugar so prepared, in a solid form, not less than thirty pounds weight, with an *account* of the process, and *certificates* that not less than one hundred weight has been prepared, to be produced to the Society on or before the first Tuesday in February, 1807.

61. Increasing Steam. To the person who shall invent and discover to the Society a method, verified by actual experiments, of increasing the quantity or force of steam, in steam-engines, with less fuel than has hitherto been employed, provided that in general the whole amount of the expenses in using steam-engines may be considerably lessened; the gold medal, or thirty guineas. To be communicated to the Society on or before the first Tuesday in January, 1807.

62. Substitute for Tar. To the person who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind, and prepared from materials the produce of Great Britain; the gold medal, or one hundred guineas. A quantity of the substitute, not less than one hundred weight, with *certificates* that at least one ton has been manufactured, and that it can be afforded at a price not exceeding that of the best foreign tar, together with an *account* of the process, to be delivered to the Society on or before the first Tuesday in March, 1807.

63. Preparation of Tan. To the person who shall prepare in the most concentrated form, so as to be easily portable, and at a price applicable to the purposes of manufacturers, the largest quantity, not less than one hundred weight, of the principle called by the French *tannin*, which abounds in oak-bark and many other vegetable substances; the gold medal, or thirty guineas. *Certificates* of the superior quality of the quantity so prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1807.

64 Indelible Ink. To the person who shall discover to the Society a method of making a black ink proper for writing, superior to any at present known, indestructible by chemical applications, and not dearer than that which is now in common use; the silver medal, or fifteen guineas. *Certificates* that not less than two gallons of such ink have been actually prepared, and found to possess the qualities above mentioned, with a full detail of the process of making it, and two quarts of the ink, to be delivered to the Society on or before the second Tuesday in January, 1807.

65. Preparation of a red Stain for Cotton Cloth. To the person who shall communicate to the Society the cheapest and most effectual method of printing or staining cotton cloths with a red colour, by an immediate application of the colouring matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder; the gold medal, or thirty guineas. *Certificates* that the above process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length, one piece of the calico so printed, a quart of the colour in a liquid state, and a full *account* of the preparation and application, to be produced to the Society on or before the second Tuesday in January, 1807.

66. Preparation of a green Colour for printing Cotton Cloth. To the person who shall communicate to the Society the best and cheapest method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld on alumine and the solutions of indigo by earths or alkaline salts; the gold medal, or thirty guineas. *Certificates* and conditions as for premium 65.

67. Rendering Muslin less combustible. To the person who shall discover to the Society a method of rendering muslin less combustible, to be effected by a cheaper and more effectual mode than any hitherto known; the silver medal.

Specimens of the muslin so prepared, with a full account of the process employed for the purpose, to be produced to the Society on or before the first Tuesday in February, 1807.

N.B. It is expected that the means employed should neither injure the quality nor stain the muslin, nor damage any print or dye with which it may be coloured.

68. Substance for the Basis of Paint. To the person who shall produce to the Society the best substitute, superior to any hitherto known, for the basis of paint, equally proper for the purpose as the white-lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white-lead; the gold medal, or one hundred guineas. A quantity of the substitute, not less than 50lb. weight, with an *account* of the process used in preparing it, and *certificates* that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in January, 1807.

69. Red Pigment. To the person who shall discover to the Society a full and satisfactory process for preparing a red pigment, fit for use in oil and water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable; the gold medal, or thirty guineas. One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1807.

N.B. It is not required that the colour should resist the action of fire or chemical applications, but remain unaltered by the common exposure to strong light, damps, and noisome vapours.

70. Ultramarine. To the person who shall prepare an artificial ultramarine, equal in colour, brilliancy, or durability, to the best prepared from lapis lazuli, and which may be afforded at a cheap rate; the gold medal, or thirty guineas. The conditions are the same as in the preceding premium for the red pigment.

71. Statuary Marble. To the person who shall discover, within Great Britain or Ireland, a quarry of white marble fit for the purposes of statuary, and equal in all respects to those kinds now imported from Italy; the gold medal, or one hundred pounds. A block of at least three feet in length, two in height, and two in width, with an account of the situation of the quarry, and *certificates* of its possessing considerable extent, to be produced to the Society on or before the first Tuesday in February, 1807.

N.B. In order to prevent useless expense or trouble to the claimant in forwarding so large a block, the Society will be ready to examine any smaller specimen of the marble, and express their opinion of its value to the candidate before the block required by the above premium is produced.

72. Preparation of Sulphuric Acid from Sulphur without the Use of any Nitric Salt. To the person who shall prepare the largest quantity (not less than one ton) of sulphuric acid from sulphur, without any nitric salt, of a specific gravity, not inferior to the best sulphuric acid of commerce; the gold medal, or fifty guineas. *Certificates* that not less than the above quantity of such an acid has been prepared, together with a

sample, to be produced to the Society on or before the first Tuesday in January, 1807.

73. Preparation of any Alkaline or Earthen Nitrate. To the person who shall prepare, in Great-Britain, the largest quantity, not less than one hundred weight, of any salt of nitric acid, with either earths or alkalis, by a method superior to, and as cheap as those hitherto practised; the gold medal, or one hundred guineas. *Certificates* of the above quantity having been prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1807.

74. Fine Bar-Iron. To the person, in Great-Britain, who shall make the greatest quantity of bar-iron, not less than ten tons, with coak, from oak-pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for being converted into steel; the gold medal, or fifty guineas. Samples, not less than one hundred weight, with *certificates* that the whole quantity is of equal quality, to be produced to the Society on or before the first Tuesday in January, 1807.

75. Preserving Iron from Rust. To the person who shall invent and discover to the Society a cheap composition, superior to any now in use, which shall effectually preserve wrought iron from rust; the gold medal, or fifty guineas. A full description of the method of preparing the composition, with *certificates* that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with ten pounds weight of the composition, on or before the first Tuesday in January, 1807.

76. Refining Block-Tin. To the person who shall discover to the Society the best method of purifying or refining block-tin, so as to render it fit for the finest purposes to which grain-tin is now applied, and not higher in price; the gold medal, or fifty guineas. *Certificates* that not less than three tons have been so refined or purified, with a full detail of the process, and a quantity, not less than one hundred weight, of the tin so refined, to be produced to the Society, on or before the first Tuesday in January, 1807.

77. Glazing Earthen-Ware without Lead. To the person who shall discover to the Society the cheapest, safest, most durable, and most easily fusible composition, fit for the purpose of glazing the ordinary kinds of earthen-ware, without any preparation of lead, and superior to any hitherto in use; the gold medal, or thirty guineas. Specimens of the ware so glazed, with proper *certificates* of its having succeeded, and a sample of the materials made use of, to be produced to the Society on or before the first Tuesday in February, 1807.

78. Refining Copper from the Ore. To the person who shall discover to the Society the best method of separating, purifying, and refining copper from the ore, so as to render it fit for the finest purposes to which fine copper is now applied, and by a process superior to any hitherto known or in use, and not higher in price; the gold medal, or fifty guineas. *Certificates* that not less than three tons have been so prepared or refined, and a quantity not less than one hundred weight of the copper so refined, to be produced to the Society on or before the first Tuesday in February, 1807.

79. Mineralogical Map of England and Wales. To the person who shall complete and publish an accurate mineralogical map of England and Wales, on a scale of not less than ten miles to an inch, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced; the gold medal, or fifty guineas. *Certificates* of the accuracy of such map, together with the map, to be produced to the Society on or before the first Tuesday in February, 1807. The map to remain the property of the Society.

80. Mineralogical Map of Ireland. The same premium is offered for a mineralogical map of Ireland, on similar conditions.

81. Mineralogical Map of Scotland. The same premium is offered for a mineralogical map of Scotland, on similar conditions.

82. Natural History. To the author who shall publish, in the year 1806, the natural history of any county in England or Wales; the gold medal, or fifty guineas. It is required that the several natural productions, whether animal, or vegetable, or mineral, peculiar to the county, or found therein, be carefully and specifically arranged and described, in order that the public may be enabled to judge what arts or manufactures are most likely to succeed in such county. The work to be delivered to the Society on or before the last Tuesday in January, 1807.

PREMIUMS IN POLITE ARTS.

83. Honorary Premiums for Drawing, by Nobility. For the best original drawing of any kind, by young gentlemen under the age of twenty-one, sons or grandsons of peers or peeresses in their own right, of Great Britain or Ireland; the honorary medal of the Society in gold.

84. The silver medal for the best copy.

85, 86. The same premiums will be given, on the like conditions, to young ladies, daughters or grand-daughters of peers or peeresses in their own right, of Great Britain or Ireland.

87. Honorary Premiums for Draw-

ING, BY GENTLEMEN. For the best original drawing, of any kind, by young gentlemen under the age of twenty-one; the gold medal.

88. For the best copy, the silver medal.

89, 90. The same premiums will be given for drawings by young ladies.

N. B. As the foregoing honorary premiums are intended only for such of the nobility and gentry as may hereafter become patrons or patronesses of the arts; persons professing any branch of the polite arts, or any business dependent on the arts of design, or the sons or daughters of such persons, will not be admitted candidates in these classes.

91. HISTORICAL DRAWINGS. For the best historical drawing, being an original composition of three or more human figures, the height of the principal figure not less than eight inches, by persons of either sex under twenty-one years of age; the gold medal.

92. For the next in merit, the silver medal.

93. DRAWINGS OF OUTLINES. For the best outline, after the plaster cast, of any antique statue, by persons of either sex under the age of twenty-one, the figure not less than eighteen inches; the silver medal.

94. PAINTINGS IN OIL. For the best painting in oil, of a landscape after nature, the size thirty-six by twenty-eight inches, by persons of either sex under twenty-five years of age; the gold medal.

95. For the next in merit, the silver medal. Each candidate must mention from whence the view was taken.

96. DRAWING OF LANDSCAPES. For the best drawing, in water-colours, of a landscape after nature, not less than eighteen inches by twelve, by persons of either sex under twenty-one years of age; the gold medal.

97. For the next in merit, the silver medal. Each candidate must mention whence the view was taken.

98. DRAWINGS BY ENGRAVERS. For the best finished drawing of the Hercules Farnese, the size of the drawing not less than eighteen inches, by persons under twenty-one years of age; the silver medal.

99. DRAWING AND ENGRAVING. To the person who shall complete the best portrait, engraved in the line manner; the gold medal. It is required that the drawing, and two impressions of the engraving, be produced, such impressions to remain the property of the Society.

100. For the next in merit, the silver medal; on similar conditions.

101. LINE ENGRAVINGS OF HISTORICAL SUBJECTS. For the best historical engraving of any size; the gold medal.

102. For the next in merit, the silver medal.

103. LINE ENGRAVINGS OF LANDSCAPES. For the best line engraving of a landscape, the size of the engraving not limited; the gold medal.

104. For the next in merit, the silver medal.

N. B. It is not necessary, in the classes of line engravings, for the artist's name to be concealed. The first aquafortis proof is required to be sent in with two finished impressions. The aquafortis proof, and the two impressions, to remain the property of the Society.

105. PERSPECTIVE DRAWINGS OF MACHINES. For the best perspective drawings of machines, by persons under twenty-one years of age; the silver medal.

106. ENGRAVING ON WOOD OR METAL BLOCKS, &c. For the best engraving on wood or metal blocks, or any other material, so that the same be rendered capable of composition with the letter-press, of any allegorical or other subject suited to the embellishment of letter-press; the gold medal. Two or more impressions, with the block, to be produced to the Society. The impressions, but not the block, to remain the property of the Society.

107. BRONZES. For the best drapery figure or group cast in bronze; if a single figure, not less than twelve inches high; and if a group, not less than nine inches; and which will require the least additional labour to repair; the gold medal, or the silver medal and twenty guineas. The cast to be exhibited to the Society before it is begun to be repaired, with the original figure or group, together with a full explanation of the whole process.

108. ORNAMENTAL DRAWINGS FOR ARCHITECTURAL DESIGNS. For the best ornamental drawing for the purpose of embellishing architectural designs; a silver medallion, with the following engraved inscription: *The Premium given by the Society for the Encouragement of Arts, Manufactures, and Commerce, in conformity to the Will of John Stock, of Hampstead, Esq.*

CONDITIONS
FOR THE POLITE ARTS.

All the claims under this class are to be produced to the Society on or before the last Tuesday in February, 1807.

No person who has gained the first premium in any class shall be admitted a candidate in a class of an inferior age; and no candidate shall receive more than one premium in one year.

No person shall be admitted a candidate in any class, who has already obtained the first premium in that class.

No more than one performance in any class shall be received from the same candidate.

All performances (to which premiums or bounties are adjudged) shall remain with the Society till after the first Wednesday in June, when they will be re-delivered, unless mentioned in the Premiums to the contrary.

No performance shall be admitted, that has obtained a premium, reward, or gratification, from any other society, or academy, or been offered for that purpose.

All performances that obtain premiums in the Polite Arts must have been begun after the publication of such premiums, except line engravings.

It is required, that the matters for which premiums are offered, be delivered in without names, or any intimation to whom they belong; that each particular thing be marked in what manner each claimant thinks fit, such claimant sending with it a paper sealed up, having on the outside a corresponding mark, and on the inside, the claimant's name, residence, and age; which paper is not to be opened unless the candidate be successful, or by a special vote of the Society.

To encourage real merit, and prevent attempts to impose on the Society, by producing drawings made or retouched by any other person than the candidate, the Society require a specimen of the abilities of each successful candidate, under the inspection of the Committee of Polite Arts, in every instance where such proof may appear necessary.

All candidates in the Polite Arts are required to signify, on their drawings, whether the performances are originals or copies; and if copies, whence they were taken.

PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

109. Cloth from Hop-Stalks, &c. To the person who shall produce to the Society the greatest quantity, not less than 30 yards of cloth at least 27 inches wide, made in Great Britain or Ireland, of hop-stalks or bines, or other raw vegetable substances, the produce of Great Britain or Ireland, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as cloth of equal quality and appearance now made from hemp, flax, or cotton, and much finer in quality than any hitherto manufactured in England from hop-stalks, &c. the gold medal, or thirty guineas. One pound of the thread of which the cloth is made, and thirty yards of the cloth, together with proper *certificates* that the whole is manufactured from hop-stalks or bines, &c. to be produced to the Society on or before the first Tuesday in December, 1806.

N. B. The Society is already in the possession of cloth made in England from hop-stalks or bines, which may be inspected by application to the Housekeeper.

110. Hogs Bristles. To the person who shall prepare the greatest quantity of bristles, from swine bred in the united kingdoms, equal in quality to those imported from Russia or Prussia, and at as cheap a rate; the silver medal, or fifteen guineas. *Certificates* that not less than one hundred weight have been so prepared, and a sample of not less than fourteen pounds of such bristles, to be produced to the Society on or before the last Tuesday in February, 1807.

111. Wicks for Candles or Lamps. To the person who shall discover to the Society a method of manufacturing hop-stalks or bines, or any other cheap material, the growth of Great Britain, so as to render them equally fit for the purpose of supplying the place of cotton, for wicks of candles or lamps; twenty guineas. Samples, not less than five pounds weight, of the wick so prepared, to be produced to the Society on or before the last Tuesday in December, 1806, with *certificates* that the whole quantity is equal in quality to the sample.

112. Experiments to ascertain the proper Thickness of Wicks for Candles. To the person who shall make known to the Society the most satisfactory result of a series of experiments, actually made by him to determine the best thickness of cotton wicks for candles, so as to obviate the defects of those commonly used; the silver medal, or ten guineas. *Certificates* that not less than one hundred weight have been so made, and six pounds of the candles, to be produced to the Society on or before the last Tuesday in February, 1807.

N. B. The intention in offering this premium, is to ascertain the proper thickness or bulk of the wick in proportion to that of the tallow, and to remove the unpleasant consequences and waste arising from the sparkling or guttering of the candles in common use.

113. Paper from raw Vegetable Substances. To the person in Great Britain, or Ireland, who shall, between the first of January, 1806, and the first of January, 1807, make the greatest quantity, and of the best quality (not less than ten reams), of good and useful paper, from raw vegetable substances, the produce of Great Britain or Ireland, of which one hundred weight has not been used in manufacturing paper previous to January, 1805, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as paper of equal quality and appearance now made from rags; twenty guineas.

N. B. The object of the Society being to add to the number and quantity of raw materials used in this manufacture, it is their wish

to include every useful sort of paper, and to introduce such natural products as can be easily and cheaply procured in great quantities. The Society are in possession of two volumes containing a great variety of specimens of paper made from raw vegetable substances, viz.—nettles, potato-haum, poplar, hop-bines, &c. which volumes may be inspected by any person on application to the Housekeeper. *Certificates* of the making such paper, and one ream of the paper, to be produced on or before the second Tuesday in January, 1807.

114. Transparent Paper. To the person who shall discover to the Society a method of making paper from the pulp, that shall be perfectly transparent, and of a substance and body equal to foolscap, that shall take and bear common writing ink with the same facility and correctness as writing-paper generally in use; the silver medal, or twenty guineas. *Certificates* of the making such paper, an *account* of the process, and one ream of the paper to be produced on or before the second Tuesday in January, 1807.

115. Chints Patterns for Calico-Printers. For the best original pattern in a new taste, of light or dark-ground chints for garment-work, or furniture, fit for the purposes of calico-printers, by persons of either sex; the gold medal. The pattern for which the premium is adjudged, to remain the property of the Society.

116. For the next in merit; the silver medal, on similar conditions.

117. Copper-plate Patterns for Calico-Printers. For the best pattern, in a new style, fit for the purposes of calico-printers for garment-work, or furniture; the silver medal. The pattern for which the premium is adjudged, to remain the property of the Society.

N. B. The patterns to be produced on or before the last Tuesday in February, 1807.

PREMIUMS IN MECHANICKS.

118. Gunpowder-Mills. To the person who, in the year 1806, shall invent and bring to perfection the most effectual method of so conducting the works of gunpowder-mills, in the business of making gunpowder, as to prevent explosion; the gold medal, or one hundred guineas. *Certificates* and *accounts* of the method having been put in practice in one or more gunpowder-mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1807.

N. B. As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of gunpowder making, which fall short of the total prevention of explosion, and they are sent to the Society for the sake of humanity, the papers so sent in will receive due consideration, and such bounty or reward will be bestowed as they may appear to merit.

119. Transit Instrument. To the person who shall invent and produce to the Society a cheap and portable transit-instrument which may easily be converted into a zenith-sector, capable of being accurately and expeditiously adjusted for the purpose of finding the latitudes and longitudes of places, and superior to any portable transit-instrument now in use; the gold medal, or forty guineas. To be produced on or before the last Tuesday in January, 1807.

120. Taking Whales by the Gun-Harpoon. To the person who, in the year 1806, shall strike the greatest number of whales, not fewer than three, with the gun-harpoon; ten guineas. *Certificates* of the striking such whales, and that they were actually taken in the year 1806, signed by the master, or by the mate, when the claim is made by the master, to be produced to the Society on or before the last Tuesday in December, 1806.

121. Family Mill. To the person who shall invent and produce to the Society the best-constructed mill for grinding corn for the use of private families, or parish-poor; the construction to be such as to render the working of the mill easy and expeditious, and superior to any hitherto in use; the gold medal, or thirty guineas. The mill and *Certificates* of its having been used to good effect, to be produced to the Society on or before the first Tuesday in February, 1807. Cheapness and simplicity will be considered as essential parts of its merit; and the mill or a model, to remain with the Society.

122. Machine for raising Coals, Ore, &c. &c. To the person who shall invent a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use; and which shall produce the effect at a less expense than those already known, or in use; the gold medal or fifty guineas. A model of the machine, made on a scale of not less than one inch to a foot, with a *Certificate* that a machine at large on the same construction has been advantageously used, to be produced to the Society on or before the second Tuesday in February, 1807.

123. Improved Walking-Wheel, or Crane. To the person who shall invent an improved walking-wheel or crane, on which the weight and power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or less

weight to be raised or lowered ; the gold medal, or thirty guineas. The model on a scale of not less than one inch to a foot, with a proper *Certificate* that the machine at large has been employed to good effect, to be produced to the Society on or before the second Tuesday in February, 1807.

124. Machine for raising Water. To the person who shall invent a machine on a better, cheaper, and more simple construction than any hitherto known or in use for raising water out of wells, &c. from a depth of not less than fifty feet ; the gold medal, or forty guineas. *Certificates* of the performance of the machine, and a model of it, on a scale of not less than one inch to a foot, to be produced to the Society on or before the first Tuesday in February, 1807.

125. Elm Pipes. To the person who shall invent and discover to the Society a substitute for the elm pipes now in common use for the conveyance of water, which shall be cheaper, equally effectual, and more durable than any heretofore employed ; the gold medal, or thirty guineas. It is required that one of the pipes so employed, an accurate *account* of the method used, and every expense attending it, together with satisfactory accounts of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1807.

126. Laying Wooden Pipes. To the person who shall invent and discover to the Society a superior method of laying or connecting the wooden pipes now in use for conveying water so as to lessen the injury they receive thereby ; the silver medal, or fifteen guineas.

It is required that a model, an accurate account of the method used, and every expense attending it, together with satisfactory *Certificates* of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1807.

127. Extinguishing Fires. To the person who shall produce to the Society the best and most effectual method of procuring an immediate supply of water in case of fire, or for the means best calculated to prevent or extinguish accidental fires in buildings, superior to any now in use ; the gold medal, or thirty guineas. *Certificates* of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the second Tuesday in January, 1807.

128. Boring and Blasting Rocks. To the person who shall discover to the Society a more simple, cheap, and expeditious method than any hitherto known or in use of boring or blasting rocks in mines, shafts, wells, &c. ; the gold medal or thirty guineas. *Certificates* of the method having been practised with success, with a full desription thereof, to be delivered to the Society on or before the first Tuesday in January, 1807.

129. Heating Rooms for the purpose of Manufacturers. To the person who shall invent and discover to the Society a method of heating rooms, superior to any hitherto known or in use, and at a moderate expense, for the purpose of painters, japanners, and other manufacturers so as to avoid the necessity of iron or copper tunnels going through the rooms to convey the smoke, whereby the danger from such tunnels may be prevented ; the gold medal or forty guineas. A model or complete drawing and description of the method, with *Certificates* that it has been successfully practised, to be delivered to the Society on or before the last Tuesday in March, 1807.

130 Improved Ventilation. To the person who shall invent and produce to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used ; the gold medal, or fifty guineas. A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *Certificates*, to be delivered to the Society on or before the last Tuesday in February, 1807.

131. Preventing Accidents from Horses falling with two-wheeled Carriages. To the person who shall invent and produce to the Society a method superior to any hitherto known or in use, to prevent accidents from the falling of horses with two-wheeled carriages, especially on steep declivities ; the silver medal, or fifteen guineas. A model of the apparatus, and a full account of the means by which the effect has been produced, with proper *Certificates* that the same has been used with success, to be delivered to the Society on or before the second Tuesday in January, 1807.

132. Improving Turnpike and other Roads. To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiments, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat or any other mode, so as to form an even, hard, and durable carriage-road, not liable to be injured by heat or rain ; the gold medal, or fifty guineas. It is required that an accurate *account* of the method used, and every expense attending it, together with satisfactory *Certificates* of its being effectual, be delivered to the Society on or before the first Tuesday in March, 1807.

133. Cleansing Chimnies. To the person who shall invent and produce to the Society the most effectual mechanical or other

means for cleansing chimnies from soot, and obviating the necessity of children being employed within the flues; the gold medal.

134. For the next in merit; the silver medal. The mechanical or other means, with *Certificates* of their having been used with proper effect, to be produced to the Society on or before the first Tuesday in January, 1807.

135. Chimnies Cleansed. To the person who shall during the year 1806 cleanse, or cause to be cleansed, the greatest number of chimnies, at least two stories high, not fewer than three hundred, by any mechanical or other process, which does not require the employment of boys within the flues; the gold medal. *Certificates*, signed by not less than two-thirds of those housekeepers on whose premises the said means have been employed, and an account of the process, to be produced to the Society on or before the first Tuesday in February, 1807.

136. To the person who shall cleanse, or cause to be cleansed, the next greatest number of chimnies, not fewer than one hundred and fifty, upon similar conditions to the above; the silver medal.

137. Raising the Bodies of Persons who have sunk under Water. To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water; the gold medal, or thirty guineas. The drag, or machine to answer the purpose intended, to be produced to the Society on or before the first Tuesday in March, 1807.

138. For preventing prejudicial effects to the persons employed in Pointing Needles. To the person who shall invent and produce to the Society a mode of obviating the prejudicial effects that attend the operation of pointing needles, by grinding them dry, during which the particles of grinstone dust and steel, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders; the gold medal, or thirty guineas. A model of the apparatus, and a full account of the means by which the effect has been produced, together with proper *certificates* of its practicability and adoption, to be delivered to the Society on or before the second Tuesday in March, 1807.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE.

139. Taking Porpoises. To the people in any boat or vessel, who, in the year 1806, shall take the greatest number of porpoises on the coast of Great Britain or Ireland, by gun, harpoon, or any other method, not fewer than thirty, for the purpose of extracting oil from them; the gold medal, or thirty pounds. *Certificates* of the number, signed by the persons to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in January, 1807.

140. Oil from Porpoises. To the person who shall manufacture the greatest quantity of oil from porpoises taken on the coast of Great Britain or Ireland, in the year 1806, not less than twenty tons; the gold medal, or thirty pounds. *Certificates* of the oil having been made from porpoises actually caught on the coast of Great Britain or Ireland, and two gallons of the oil as a sample, to be produced to the Society on or before the last Tuesday in February, 1807.

141. Curing Herrings by the Dutch Method. To the person or persons who shall, before January, 1807, cure the greatest quantity of white herrings, not less than thirty barrels, according to the method practised by the Dutch, and equal in all respects to the best Dutch herrings, the same being caught in the British or Irish Seas, and cured in a British or Irish vessel or port; the gold medal, or fifty guineas.

142. For the next greatest quantity, not less than fifteen barrels; the silver medal, or twenty guineas. A sixteen-gallon barrel of the herrings to be produced to the Society on or before the first Tuesday in February, 1807, with *certificates* that the conditions of the premium have been fulfilled, and that the whole were cured in the same manner as the specimen, together with a full description of the process employed, in order that the Society may judge how far the Dutch method has been adopted.

143, 144. The same premiums are extended one year further. *Certificates* to be produced on or before the first Tuesday in February, 1807.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH COLONIES.

145. Nutmegs. For the greatest quantity of merchantable nutmegs, not less than ten pounds weight, being the growth of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, and equal to those imported from the islands of the East Indies; the gold medal, or fifty guineas. Satisfactory *certificates*, from the governor, or commander in chief, of the place of growth, with an *account* of the number of trees, their age, nearly the quantity of fruit on each tree, and the manner of culture, to be

produced on or before the first Tuesday in December, 1806.

146. The same premium is extended one year farther. *Certificates* to be produced on or before the first Tuesday in December, 1807.

147. KALI FOR BARILLA. To the person who shall have cultivated, in the Bahama Islands, or any other part of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, in the year 1805, the greatest quantity of land, not less than two acres, with Spanish kali fit for the purpose of making barilla; the gold medal, or thirty guineas.

148. For the next greatest quantity, not less than one acre; the silver medal, or fifteen guineas. *Certificates*, signed by the governor, or commander in chief, for the time being, of the quantity of land so cultivated, and of the state of the plants at the time of signing such *certificates*, to be delivered to the Society, with samples of the kali, on or before the second Tuesday in January, 1807.

149. The same premiums are extended one year farther. *Certificates* to be produced on or before the second Tuesday in January, 1808.

150. DESTROYING THE INSECT COMMONLY CALLED THE BORER. To the person who shall discover to the Society an effectual method of destroying the insect commonly called the Borer, which has of late years been so destructive to the sugar-canes in the West-India islands, the British settlements on the coast of Africa, and the several islands adjacent thereto; the gold medal, or fifty guineas. The discovery to be ascertained by satisfactory *certificates*, under the hand and seal of the governor or commander in chief for the time being, and of some other respectable persons, inhabitants of the islands, or other place, in which the remedy has been successfully applied; such *certificates* to be delivered to the Society on or before the first Tuesday in January, 1807.

151. The same premium is extended one year farther. *Certificates* to be produced on or before the first Tuesday in January, 1808

152. CULTIVATION OF HEMP IN UPPER OR LOWER CANADA. To the person who shall sow with hemp, the greatest quantity of land in the province of Upper Canada, not less than six arpents (each four-fifths of a statute acre), in the year 1806, and shall at the proper season cause to be plucked the summer hemp, or male hemp bearing no seed, and continue the winter hemp, or female hemp bearing seed, on the ground until the seed is ripe; the gold medal, or one hundred dollars.

153. To the person who shall sow with hemp the next greatest quantity of land in the same province of Upper Canada, not less than five arpents, in the year 1806, in the manner above mentioned; the silver medal, or eighty dollars.

154. For the next greatest quantity of land, in the same province, and in a similar manner, not less than four arpents; sixty dollars.

155. For the next greatest quantity of land, in the same province, and in a similar manner, not less than three arpents; forty dollars.

156. For the next greatest quantity of land, in the same province, and in the same manner, not less than one arpent; twenty dollars. *Certificates* of the number of arpents, the method of culture, of the plucking of the hemp, with a general *account* whether sown broad-cast or in drills, the expense, soil, cultivation, and produce, to be transmitted to the Society, certified under the hand and seal of the governor or lieutenant-governor, together with 28lb. of the hemp, and two quarts of the seed, on or before the last Tuesday in November, 1807.

157 to 161. Premiums exactly similar in all respects to those held out for the province of Upper Canada, are also offered for the province of Lower Canada, and are extended to the same period.

162. IMPORTATION OF HEMP FROM CANADA. To the master of that vessel, which shall bring to this country the greatest quantity of marketable hemp, not less than one hundred tons, in the year 1806, the produce of Upper or Lower Canada; the gold medal.

163. To the master of that vessel which shall bring the next quantity, not less than fifty tons, the silver medal. *Certificates* satisfactory to the Society to be produced by the master of the vessel on or before the first Tuesday in February, 1807, to testify that such hemp was grown and prepared in Canada.

164. SUBSTITUTE FOR HEMP. To the person who, in the year 1807, shall discover and produce to the Society a substitute for hemp, equally cheap, durable, and applicable to all the purposes for which hemp is now used; the gold medal, or fifty guineas. A quantity of the substitute, not less than one hundred weight, together with proper *certificates* from the governor or commander in chief, if raised in any of the British colonies, or from the Secretary of the Board of Trade, if raised in the East Indies, to prove that the same has been used with success, to be produced to the Society on or before the last Tuesday in February, 1808.

165. The same premium is extended one year farther.

Certificates to be produced on or before the last Tuesday in February, 1809.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH SETTLEMENTS IN THE EAST INDIES.

166. BHAUGULPORE COTTON. To the person who shall import into the port of London,

in the year 1806, the greatest quantity, not less than one ton, of the Bhaugulpore cotton, from which cloths are made in imitation of nankeen, without dyeing; the gold medal. A quantity of the cotton, not less than five pounds weight, in the pod, and five pounds carded, to be produced to the Society, with proper *certificates*, signed by the Secretary to the Board of Trade of Bengal or Bombay, on or before the last Tuesday in February, 1807.

167, 168. The same premium is extended two years farther. *Certificates* to be produced at the same time of the years ensuing.

169. Annatto. To the person who, in the year 1806, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of annatto, not less than five hundred weight; the gold medal. A quantity of the annatto, not less than ten pounds weight, to be produced to the Society, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the annatto is the produce of such settlement, on or before the last Tuesday in February, 1806.

170. 171. The same premium is extended two years farther. *Certificates* to be produced at the same time of the years ensuing.

172. True Cochineal. To the person who, in the year 1806, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of true cochineal, not less than five hundred weight; the gold medal. A quantity of the cochineal, not less than ten pounds weight, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the cochineal is the produce of such settlement, to be produced to the Society on or before the first Tuesday in February, 1807.

173. 174. The same premium is extended two years farther. *Certificates* to be produced at the same time of the years ensuing.

GENERAL CONDITIONS.

ORDERED, Society's House, Adelphi, June 1st, 1806.

That the several Candidates and Claimants, to whom the Society shall adjudge Premiums or Bounties, do attend at the Society's House, in the Adelphi, on the last Tuesday in May, 1807, at Eleven in the Morning precisely, to receive the same; that Day being appointed by the Society for the Distribution of their Rewards: And before that time no Premium or Bounty will be delivered, excepting to those who are about to leave the Kingdom.

In cases where the Society may think fit to admit excuses for not attending in person, Deputies may be substituted to receive the Rewards, provided such Deputies are either Members of the Society, or superior Officers thereof.

As the great object of the Society in rewarding individuals is to draw forth and give currency to those inventions and improvements, which are likely to benefit the public at large, candidates are requested to observe, that if the *means*, by which the respective objects are effected, do require an expense or trouble too great for *general purposes*, the Society will not consider itself as bound to give the offered *reward*; but, though it thus reserves the power of giving in all cases such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the candidates may be assured the Society will always judge liberally of their several claims.

All candidates are to take notice, that no claim for a premium will be attended to, unless the conditions of the advertisement are fully complied with.

All models of machines, which obtain premiums or bounties, shall be the property of the Society; and, where a premium or bounty is given for any machine, a perfect model and description thereof shall be given to the Society.

All the premiums of this Society are designed for Great Britain and Ireland, unless expressly mentioned to the contrary.

The claims shall be determined as soon as possible after the delivery of the specimens.

It is expected that all articles for claims or bounties be sent to the Society, carriage paid.

No person shall receive any premium, bounty, or encouragement, from the Society, for any matter for which he has obtained, or purposes to obtain, a patent, or for which he has obtained, or expects any premium or reward from any other Society.

A candidate for a premium, or a person applying for a bounty, being detected in any disingenuous method to impose on the Society, shall forfeit such bounty, and be deemed incapable of obtaining any for the future.

No member of this Society shall be a candidate for, or entitled to receive, any premium, bounty, or reward whatsoever, except the honorary medal of the Society. The candidates are, in all cases, expected to furnish a particular account of the subject of their claims; and

where certificates are required to be produced in claim of premiums, they should be expressed, as nearly as possible, in the words of the respective advertisements, and be signed by persons who have a positive knowledge of the facts stated.

Where premiums or bounties are obtained in consequence of specimens produced, the Society mean to retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No candidate, not a member, shall be present at any meetings of the Society or committees, or admitted at the Society's rooms, after they have delivered in their claims, until such claims are adjudged, unless summoned by the Committee.

The Society, anxious to promote the Arts of their country, have adopted the resolution of forming a Collection of Prints, to be open for public inspection; and, having arranged those already in their possession, invite engravers to send etched or finished proofs of their plates: and hope that amateurs, collectors, and publishers of works of art, will also contribute to the undertaking.

Prints of machines, or maps, will also come within the above arrangement.

The Society farther invite the communications of scientific and practical men, upon all subjects connected with the views of the Society, although their experiments may have been conducted upon a smaller scale than the terms required by the premiums; as such communications may afford ground for more extensive application, and thus materially contribute to the advantage of the public.

The Library of the Society, which has already become very valuable, may yet receive considerable additions and improvements from the presents of members, or other persons who may be inclined to place useful books or valuable manuscripts in a repository, at once permanent and conducive to the national benefit.

All communications are to be made by letter, addressed to Dr. Charles Taylor, the Secretary, *at the Society of Arts, &c. Adelphi, London.*

The Winchester bushel is the measure referred to for grain; and, as the acres of different districts vary in extent, it is necessary to observe, that the Society mean Statute Acres of five and a half yards to the rod or pole, when acres are mentioned in their list of premiums; and they request that all communications to them may be made agreeably thereto.

The Society desire that the Papers on different subjects sent to them may be full, clear, explicit, fit for publication, and rather in the form of Essays than of Letters; and that descriptive Drawings may be sent, with the Models and Machines laid before the Society.

*** To persons inclined to leave a sum of money to this Society by will, the following form is offered for that purpose.

Item. I give and bequeath to A. B. and C. D. the sum of upon condition and to the intent that they, or one of them, do pay the same to the Collector, for the time being, of a Society in London, who now call themselves the Society for the Encouragement of Arts, Manufactures, and Commerce; which said sum of I will and desire may be paid out of my personal estate, and applied towards the carrying on the laudable designs of the Society.

N.B. The Society for the Encouragement of Arts, &c. considering that it would be beneficial to the Commerce of the United Kingdom, to bring the British Marbles into more general use, and that the most effectual method of accomplishing their object would be, for the present, *to make them more generally known in the capital, have come to the following resolutions:—*

Resolved,—That specimens of British Marbles be exposed in the Society's Rooms at the Adelphi, for the inspection of the public, under the following regulations:

1st, That all specimens be exact to a given size, *viz.* eight inches high, six inches broad, one inch thick, and polished on one face.

2d, That a book be kept, containing the number of each specimen, and describing the situation of the quarry, the name of the parish where situated, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future inquiries.

Resolved,—That as the exertions of the Society can be beneficial to the public, only inasmuch as their views are seconded by the public, the Society request, that all persons, proprietors of marble quarries, will favour them with a specimen of the marble, worked to the exact size above mentioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public.

Premiums and Rewards bestowed in May, 1806, by the Society of Arts, Manufactures, and Commerce, Adelphi.

ON Tuesday the 27th of May, 1806, the Rewards of the Society were, as usual, distributed by his Grace the Duke of Norfolk, arranged under the following classes; and on Wednesday the 4th of June, the Society held the last Meeting of that Session, and adjourned to the fourth Wednesday in October next.

IN AGRICULTURE.

To J. C. Curwen, Esq. M. P. Workington Hall, for agricultural improvements, the gold medal.

To Richard Phillips, Esq. Tyn-y-Rhos, near Oswestry, for improving waste land, class 45; the gold medal.

To J. G. Calthorp, Esq. Gosberton, Lincolnshire, for the cultivation of spring wheat, class 23; the gold medal.

To Mr. J. S. Wade, Benhall, near Saxmundham, Suffolk, for planting osiers, class 12; the gold medal.

To Charles Layton, Esq. Reedham Hall, Norfolk, for comparative culture of turnips, class 26; the silver medal.

To Mr. Wm. Cheetham, Mellor Moor, Derbyshire, for improving waste land, the silver medal.

To Mr. Robert Salmon, Woburn, Bedfordshire, for remarks in pruning timber trees, the silver medal.

IN CHEMISTRY.

To Mr. Charles Wilson, 6, Worcester-street, Borough, for a method of curing damp walls, ten guineas.

IN POLITE ARTS.

To her Serene Highness the Margravine of Brandenburgh Anspach, and Bareith, &c. &c. for a model in bas-relief of the late Margrave, the silver medal.

To Miss Folkes, Cavendish-square, for miniature paintings, the silver medal.

To Mr. Sebastian Grandi, 6, Brownlow-street, Long-acre, for colours and materials for painting, the silver medal.

To Mr. J. B. Lane, 18, Upper Grosvenor-street, for an historical drawing of Alexander attacking the Persians, after crossing the Granicus, the silver pallet.

To Miss H. A. Jackson, Hanover-street, Hanover-square, for a drawing from nature of a Lady Bathing, class 100; the gold medal.

To Miss Hillier, Stoke Park, Guildford, for a drawing of Flowers from Nature, the greater silver pallet.

To Miss Francillon, Norfolk-street, for a drawing of Flowers from Nature, the greater silver pallet.

To Miss S. C. Day, Lower Bryanston-street, for an original drawing of Augustus entering the Apartment of Cleopatra, the smaller silver pallet.

To Mr. G. Gutch, Oxford, for a drawing of Wrexham, class 99; the silver medal.

To Mr. P. M. French, Great Alie-street, for an Architectural Drawing, the smaller silver pallet.

To Mr. A. Raimback, Warren-street, for a line engraving of Punishments in Tartarus, class 107; the gold pallet.

To Mr. L. Clennel, Twickenham Common, for an engraving on wood of a Battle, class 110; the gold pallet.

To Mr. Branston, Wynnyatt-street, for an engraving on wood of a scene in the Comedy of Measure for Measure, the smaller silver pallet.

To Miss Mary Hay, Chandos-street, for a drawing of the Ecce Homo; the silver medal, set in gold.

To Miss Zornlin, Newington-place, Kennington, for a drawing of Antigone, the greater silver pallet.

To Miss Beverley, Spring-gardens, for a drawing of a Landscape, the smaller silver pallet.

To Mr. J. S. Halfpenny, 59, Stafford-place, Pimlico, for a drawing of the Antinous, class 105; the greater silver pallet.

To Mr. George Corbould, 70, John-street, for a drawing of an Antique Statue, the smaller silver pallet.

To Mr. John Romney, Warren-street, for a drawing of Outlines, class 102; the smaller silver pallet.

To Miss Andree, Hatton-garden, for a portrait of a Lady, in oils, the greater silver pallet.

To Miss Sarah Benwell, Oxford, for a drawing of Our Saviour on the Cross, the greater silver pallet.

To Miss E. Scott, St. James's street, Brighthelmstone, for a drawing of the Virgin and Child, the greater silver pallet.

To Miss M. A. Barron, New London-street, Tottenham-court-road, for a drawing of the Death of Socrates, the smaller silver pallet.

To Mr. Richard Neate, Hadley, who is crippled in all his limbs, except his left arm,

for a drawing of the Holy Family, the smaller silver pallet.

To Mr. Sebastian Grandi, 6, Brownlow-street, Long-acre, for a preparation of grounds or pannels for painters, 20 guineas.

IN MANUFACTURES.

To Mr. J. Robertson, Edinburgh, for a method of weaving fishing-nets, 20 guineas.

To Mr. William Neven, Barrack-court, Woolwich, for weaving extremely fine cloth, 15 guineas.

IN MECHANICKS.

To Dr. Thomas Cogan, Bath, for a drag to save persons from being drowned, class 140; the gold medal.

To John Trotter, Esq. Soho-square, for a curvilinear saw, the gold medal.

To Mr. John Austin, Glasgow, for a loom, worked by machinery, the gold medal.

To Mr. Neil Snodgrass, Johnstone, county of Renfrew, Scotland, for a mode of heating rooms by steam; 40 guineas.

To Mr. J. Middleton, St. Martin's lane, for improvements in printing paper-hangings, the silver medal.

To Mr. G. Field, Newman-street, for a stove for heating rooms, or drying different articles, the silver medal.

To Mr. Benjamin Stott, Bermondsey-street, for a machine for splitting sheep-skins, 20 guineas.

To Mr. James Hardie, Glasgow, for a book-binder's press, 15 guineas.

To Mr. Joseph Davis, 14, Crescent, Kingsland-road, for a machine to prevent accidents to glaziers or painters, 10 guineas.

To Mr. A. Stass, 18, Porter-street, Newport market, for a machine to assist in making shoes, 10 guineas.

IN COLONIES AND TRADE.

To Mr. Philemon Wright, county of York, Lower Canada, for the culture of hemp, the silver medal.

To Mr. Frederick Arnold, River Thames, Upper Canada, for the culture of hemp, the silver medal.

To Mr. Joshua Cornwall, River Thames, Upper Canada, for the culture of hemp, the silver medal.

To Mr. G. Ward, township of Camden, Upper Canada, for the culture of hemp, class 192; 20 dollars.

The Number of Members elected since October, 1805, is 142.

The List of Premiums offered may be had *gratis*, at the Society's House in the Adelphi; and will also be published in the Universal and Agricultural Magazines for July, 1806.

By Order of the Society,

CHARLES TAYLOR, M.D. Secretary.

June 1806.

PAPERS

IN

AGRICULTURE.

AGRICULTURE.

The GOLD MEDAL *of the Society was this Session voted to* JOHN CHRISTIAN CURWEN, Esq. M. P. *of Workington Hall, in Cumberland, for the following* AGRICULTURAL COMMUNICATIONS *on his* CULTURE of CARROTS, *his Method of* FEEDING MILCH COWS *in Winter, and on his* DRILL HORSE HOE.

Account of Mr. CURWEN'S *Method of* CULTIVATING CARROTS, *and applying them as* FOOD *for* CATTLE.

DEAR SIR,

IF you judge the subjoined account of the Culture of Carrots deserving the attention of the Society, I will beg you to submit it to their inspection; with many thanks for your kind attentions.

I am, Dear Sir,
Your obedient Servant,
J. C. CURWEN.

Workington Hall, Dec. 14, 1805.

To DR. C. TAYLOR.
Secretary to the Society of Arts, &c.
Adelphi, London.

SIR,

IN Mr. A. Young's valuable and interesting Report on the Agriculture of Suffolk, I was much struck with his account of the culture of carrots, and the advantages resulting from the application of them as food for horses.

From the very general opinion which prevails, that none but particular soils are applicable to the growth of carrots, the culture of them to any extent has been confined to small districts. I presume, therefore, that it may not be unacceptable to the Society to be informed of the success of trials in this matter upon a stiff loam, partaking, in a great measure, of clay.

Mr. Young's observations are confined to sowing by broad-cast, which can be successful solely in sandy soils. The method I have pursued has been to trench plough, and stitch up the ground intended for carrots, as soon as it was clear, leaving it in that state during winter, which greatly facilitates its working in the spring. In April I break it up by giving it three or four ploughings, harrowings, and rakings, which bring it into garden tilth. Previous to the last ploughing I give from ten to fifteen cart loads of ashes per acre. The second week in May I have it stitched up, and made ready for sowing; allowing three feet between each stitch; and I throw the ridges as high as they can be put. The tops of the stitches are smoothed with a very light roller, so as to admit of a furrow being drawn with a hand hoe.

The seed, ten days or a fortnight before it is used, is mixed with wet sand, and placed in some warm situation, so as to be in a full state of vegetation before it is sown. A fortnight is gained by this method, and the carrots are less liable to be injured by the weeds. The plough and harrow are kept at work during the whole summer. The plants are twice hand-weeded, and afterwards thinned. The expense attending this is considerable, but the value of the crop amply compensates it.

In 1804 I had an acre and a rood, which had been previously occupied by cabbages, and afterwards by tares. The soil was very heavy and strong. The tops of this crop were so abundant, that they would have fed twenty head of cattle

tle for a month. I began cutting them too late, by which means I lost a great part. It is essentially necessary to get the carrots dry, to enable them to keep. I endeavour, if the weather be favourable, to have them up by the first or second week in October. I employ women to take them up with forks, which costs 10*l.* The crop yielded 829 Winchester bushels, equal to 4143 stone (of 14 pounds). Estimating the carrots at 6*d.* per stone (the price of oats at that time) they were worth to me 103*l.*

Each working horse in my employ is allowed 8*lb.* of oats per day. One half was taken away, and supplied by an equal weight of carrots, and this was continued while they lasted. The general opinion was, that the horses improved in their condition upon this food.

In 1805 I had three acres and three roods of a similar soil sown with carrots, which had previously borne a crop of oats. The first part of the season was uncommonly cold, and afterwards unusually wet, which checked the growth of the tops, so that they never got to any size, and were eaten off by sheep. In order to facilitate the work, and at the same time to save expense, I made a trial of the plough to take off the earth from the carrots, and then setting in and turning them up.

The injury was trifling, and the expense not a tenth part what it had been. There were 108 carts of 80 stone each, or 2246 stone per acre, which, at 6*d.* per stone, would amount to 60*l.* and upwards per acre. I have made use of them as in the preceding year, with the most complete success, and saved 60 bushels of oats per week, and shall be able to continue to do so for a fortnight or three weeks longer.

In the first trial an acre of carrots was equal in food to 23 of oats, allowing 60 Winchester bushels of oats per acre, and at three stone the bushel. On taking up the carrots a small piece was cut from the top of each, to prevent it from vegetating, and these were immediately used. The remain-

der were piled in rows two feet thick, and five feet high, leaving a space between each row for a free circulation of air. I do not doubt but that they would keep in this way for a length of time. I have always made immediate use of them, as old oats are more valuable than new, and moreover, the saving of oats is in itself a matter of much import.

The success of these trials has determined me to extend the cultivation of carrots, and I have prepared ten acres for the ensuing season.

Mr. Young recommends carrots as a substitute for hay: when they can be procured with little or no expense, this may answer; but when the ground is to be prepared for them at a considerable expense, cheaper substitutes may be found. Though the expenses are great in cultivating carrots, yet the giving of them in part instead of oats, will most abundantly repay them. The expense of each acre in sowing, cleaning, and housing, will not be short of 15*l.*

Whatever system can multiply the produce of one acre into that of two or more, is, I conceive, an object to a country where the consumption of the first necessary of life exceeds what is at present produced within the empire. In this point of view I flatter myself that the present paper may not be thought unworthy the attention of the Society.

We, Isaac Kendall, bailiff, and Thomas Moore, groom, to J. C. Curwen, Esq. do certify, that Mr. Curwen's working horses had 4*lb.* of carrots given them in the room of so much oats, from October 1805 to January 1806, being three months: that without the use of carrots Mr. Curwen allows his working horses from 8 to 12*lb.* of oats per day, according to the size and work of the horses; that the carrots answered every purpose, and that the horses were never in better condition than at the time when they were

were in use; and we believe that they would not have been better, nor fitter for work, with the whole allowance of oats; that the crops of carrots have been extremely good by Mr. Curwen's mode of management. The saving of oats was 58 Winchester bushels per week by the use of carrots upon the food of 76 horses.

Workington, May 10, 1806.

Account of Mr. CURWEN'S METHOD *of* FEEDING COWS, *during the Winter Season, with a View to provide poor Persons and Children with Milk at that Time.*

SIR,

EVERY attempt to ameliorate the condition of the labouring classes of the community is an object not unworthy of public attention; and has on all occasions been zealously patronised by the Society of Arts. Under this impression I hope for the indulgence of the Society in calling their attention to an experiment, which I flatter myself will in its consequence prove not only highly beneficial to the lower orders of society, but tend likewise to the advancement of agriculture.

There is not any thing, I humbly conceive, which would conduce more essentially to the comfort and health of the labouring community and their families, than being able to procure, especially in winter, a constant and plentiful supply of good and nutritious milk. Under this conviction, much pains have been taken to induce the landed proprietors to assign ground to their cottagers, to enable them to keep a milch cow. The plan is humane, and highly meritorious; but unfortunately its beneficial influence can reach but a few. Could farmers in general be induced from humanity, or bound by their landlords to furnish milk to those, at least,

whom they employ, it would be more generally serviceable. Even those who have the comfort of a milch cow would find this a better and cheaper supply, as they can seldom furnish themselves with milk through the winter. The farmer can keep his milch cows cheaper and better; for, besides having green food, his refuse corn and chaff of little value, are highly serviceable in feeding milch cows.

My object is to combat the prevailing opinion, that dairies in summer are more profitable than in winter. I confidently hope to establish a contrary fact. The experiment I am about to submit to the Society, is to prove, that by adopting a different method of feeding milch cows in winter, to what is in general practice, a very ample profit is to be made, equal if not superior to that made in any other season.

I believe the principle will hold good equally in all situations: my experience is confined to the neighbourhood of a large and populous town.

The price of milk is one-fifth higher in winter than in summer. By wine measure the price is *2d.* per quart new milk, *1d.* skimmed.

My local situation afforded me ample means of knowing how greatly the lower orders suffered from being unable to procure a supply of milk; and I am fully persuaded of the correctness of the statement, that the labouring poor lose a number of their children from the want of a food so pre-eminently adapted to their support.

Stimulated by the desire of making my farming pursuits contribute to the comfort of the public, and of those by whose means my farm has been made productive, I determined to try the experiment of feeding milch cows after a method very different to what was in general practice. I hoped to be enabled thereby to furnish a plentiful supply of good and palatable milk, with a prospect of its affording a fair

fair return of profit, so as to induce others to follow my example.

The supply of milk, during the greatest part of the year, in all the places in which I have any local knowledge, is scanty and precarious, and rather a matter of favour than of open traffic.

Consonant with the views I entertained of feeding milch cows, I made a provision of cabbages, common and Swedish turnips, Kholrabi, and cole seed. I made use also of chaff, boiled, and mixed, with refuse grain and oil cake. I used straw instead of hay for their fodder at night.

The greatest difficulty, which I have had to contend with, has been to prevent any decayed leaves being given. The ball only of the turnip was used. When these precautions were attended to, the milk and butter have been excellent.

Having had no previous knowledge of the management of a dairy, my first experiment was not conducted with that frugality requisite to produce much profit.

I sold the first season, between October 1804 and the 10th of May 1805, upwards of 20,000 quarts of new milk. Though my return was not great, I felt a thorough conviction that it proceeded from errors in the conduct of the undertaking, and that, under more judicious management, it would not fail of making an ample return, which the subsequent experiment will prove. In the mean time I had the satisfaction of knowing, that it had contributed essentially to the comfort of numbers.

In Oct. 1805, my dairy recommenced with a stock of 30 milch cows; a large proportion of these were heifers; and in general the stock was not well selected for giving milk; for they were purchased with a view of their being again sold as soon as the green crop should be exhausted. If the plan be found to answer under such unfavourable circumstances,

cumstances, what may not more experienced farmers expect?

By the end of this present month I shall have sold upwards of 40,000 quarts of milk.

The quantity of food, and its cost, are as follow. The produce of milk from each cow upon 200 days, the period of the experiment, is calculated at no more than 6 wine quarts in the 24 hours: this is to allow for the risk and failure in milk of some of the heifers. A good stock, I have no doubt, would exceed 8 quarts in the two meals, which would add 100*l.* to the profit.

Daily cost of feeding one milch cow:

	£.	s.	d.
Two stone of green food (supposing 30 tons of green crop on an acre at ¼*d.* per stone would pay 5*l.* per acre) at ¼*d.* per stone of 14*lb.* - -	0	0	0½
Two stone of chaff boiled, at 1*d.* per stone -	0	0	2
Two *lbs.* of oil cake at 1*d.* per *lb.* costing from 8*l.* to 9*l.* per ton - - -	0	0	2
Eight *lbs.* of straw at 2*d.* per stone - -	0	0	1
	0	0	5½

The chaff, beyond the expense of boiling, may be considered as entirely profit to the farmer; 2*d.* per stone for straw likewise leaves a great profit. Turnips also pay the farmer very well at ¼*d.* per stone.

Expense of feeding one milch cow for 200 days, the period upon which the experiment is made:

	£.	s.	d.
200 days keep of one milch cow, at the rate of 5½*d.* per day - - -	4	11	8
Attendance - - -	2	0	0
Supposed loss on resale - - -	2	0	0
	£.8	11	8

Return

Return made of one milch cow in 200 days milking:

	£.	s.	d.
6 quarts per day at 2*d.* per quart, for 200 days -	10	0	0
Calf - - - - -	2	0	0
Profit on 20 carts of manure, 1*s.* 6*d.* each -	1	10	0
	13	10	0
Clear gain upon each milch cow -	£.4	18	4

This gives a profit upon the whole stock of £.147 10*s.* The profit of another month may be added before a supply of milk can be had from grass, which will make the balance of profit 167*l.* 18*s.* 4*d.* This profit, though not as large as it ought to have been, had the stock been favourable for the experiment, far exceeds what could be made of the same quantity of food by fattening cattle. Were the two quarts to be added, which on a moderate computation might be expected, the gain would then be £.267 16*s.* 4*d.* The trifling quantity of land, from which the cattle were supported, is a most important consideration. One half of their food is applicable to no other purpose, and is equally employed in carrying on the system of a corn farm. I have found oil cake of the utmost advantage to my dairy, promoting milk, and contributing greatly to keep the milch cows in condition. The best method of using it is to grind it to a powder, and to mix it in layers and boil it with the chaff: half the quantity in this way answers better than as much more given in the cake, besides the saving of 2*d.* a day on each beast. This I was not aware of on my first trial. The oil cake adds considerably to the quantity and richness of the milk without affecting its flavour. The refuse corn was likewise ground and boiled: it is charged also at 1*d.* per pound. I make use of inferior barley to great advantage. A change of food is much to the advantage of the dairy. Potatoes steamed would answer admirably; but near towns they are too expensive.

By repeated trials it was found that 7 quarts of strippings, wine

wine measure, gave a pound of butter, while 8 quarts of a mixture of the whole milk was required to produce the same weight. Contrast this with milk produced from the feeding of grains, 20 quarts of which will scarce afford a pound of butter.

The Agricultural Report of Lancashire, treating on the milk in the neighbourhood of Liverpool and Manchester, states 18 quarts with a hand churn, and 14 or 15 with a horse churn. In a paper published by the Bath Society, 12 quarts are said to give a pound of butter: but whether ale or wine measure is not specified. A friend of mine, who feeds his milch cows principally on hay, finds 16 wine quarts will not yield more than 17 ounces of butter, and this upon repeated trials.

The milch cows, treated according to my new plan, have been in excellent order both seasons, and are allowed to be superior to any in the neighbourhood.

Cole seed I have found to be the most profitable of all green crops for milk; and it possesses the further advantage of standing till other green food is ready to supply its place.

To ascertain the benefit and utility of a supply of milk both to the consumer and the public will be best done by comparison.

To prove this let us contrast the price of milk with other articles of prime necessity, and consider how far it affords a greater produce from a less consumption of food.

I cannot here omit observing, at a moment when Great Britain can hope for no further supply of grain from the continent, and must look for and depend on her own resources for feeding her population, every mean by which the quantity of victuals can be augmented is an object of great public concern.

Each

Each milch cow yielding 6 quarts of milk per day, furnishes in the period of 200 days 2,400 pounds of milk, or 171 stone of 14 pounds, equal to twice her weight, supposing her in a state fit for killing, with a third less food, and at one half less expense. The milk costs £.10; whilst the same weight of butchers meat at 6*d.* per pound would amount to £.60.

Taking the scale of comparison with bread, we shall find a Winchester bushel of wheat of the usual weight of 4 stone and 4½ *lb.* when manufactured into flour of three sorts yields

Of first flour -	2 st.	9 lb.
Of second - -	0	7 lb.
Of third - -	0	7 lb.
	3	9 lb.
Lost by bran, &c. -	0	9½lb.

The present cost is 10*s.* 3*d.* 2,400*lb.* of the three sorts of flour will cost £.23 3*s.* 9*d.* To make it into bread allow 1*s.* per bushel, which makes the cost of bread £.26 10*s.* 9*d.* or something more than 2½*d.* per *lb.* exceeding twice the price of the same weight of milk. To furnish 2,400 *lbs.* of bread requires 47 bushels, or the average produce of two acres of wheat.

Three acres of green food supplied 30 milch cows with 2 stone each of green food for 200 days. Two stone of hay each for the same period would have required 75 acres of hay. Chaff can scarcely be considered as of any value beyond the manure it would make, which shows the profit of keeping milch cows in all corn farms.

Certificates of the quantities of milk sold and money received accompany this.

If the Society of Arts, &c. think the experiment worthy their notice and approbation, I shall be highly flattered. At all

all events I trust they will accept it as a small tribute of respect and gratitude for the many favours conferred upon their

Obedient and very humble Servant,

J. C. CURWEN.

Workington Hall, April 18, 1806.

To Dr. C. TAYLOR, Secretary.

Schoose Farm, April 18, 1806.

I ISAAC KENDAL, Bailiff to J. C. CURWEN, Esq. do certify that the following quantities of milk have been sold from the 1st of October last to the 18th of April 1806.

		£.	s.	d.
To Jan. 1, 1806	16,685			
From that date to April 18, 1806	22,027			
	38,712			
Cash received for new and skimmed milk		320	7	5½
Calves sold		44	0	0
		£.364	7	5½

I conceive the estimate of 5½*d.* per day to be correct.

	£.	s.	d.
200 days keep of 30 cows	137	10	0
Cost of attendance	60	0	0
Loss upon re-sale	60	0	0
	£.257	10	0

		£.	s.	d.
Cash received as before	£.364 7 5½			
600 carts of manure at 1*s.* 6*d.*	45 0 0			
		£.409	7	5½
Profit		£.151	17	5½

I believe

I believe the above statement to be correct. The condition and health of the milch-cows is equal, if not superior, to any in the neighbourhood.

The average of the milk is yet 200 quarts per day, varying with the weather and other accidental circumstances.

Account of Mr. Curwen's Drill Horse Hoe, *or* Weed Harrow.

SIR,

As one great and most important advantage of drill husbandry proceeds from the opportunity offered of cleaning foul grounds, as also of breaking and loosening of stiff soils, to give the power of extension to the roots of grain; whatever can facilitate these operations will, I flatter myself, be deemed worthy of the attention of the Society.

Having hitherto found great difficulty and much labour necessary in accomplishing the cleaning of wheat and other grain, I have been led to make some experiments, and I am sanguine in my hopes that the harrow I send for the inspection of the Society, will be found to accomplish the purpose with greater ease and facility than any thing at present in use.

The simplicity and ease with which it is worked has enabled me, this season, to give my wheat crop, which exceeds one hundred acres, two cleanings, and at an expense of somewhat less than a shilling per acre each operation; a man and boy, with one horse, being able to clean above seven acres per day. The direction of the harrow to prevent its injuring the grain is effected by an alteration of the chain by which it is attached to the wheels. The distance of the teeth from the centre tooth must be regulated by the width of the drills. In case they exceed a foot, the harrow should be broader to admit of another row of teeth. To clean at

nine

nine inches, two inches and a half is allowed on each side of the centre tooth, by which means every part of the earth is cut between the rows of grain. The size and strength of the teeth must be regulated by the nature of the soil. The thing is so simple that I hesitated laying it before the Society till I was encouraged by persons whose experience and knowledge is infinitely greater than my own.

The complete introduction of drill husbandry would, I conceive, be of great national importance, and under this conviction whatever can facilitate its operations may not be unworthy of attention, and will, I hope, excuse the liberty I have taken.

I have the honour to be, Sir,

Your obedient humble Servant,

J. C. CURWEN.

London, May 5th, 1806.

To Dr. C. TAYLOR.

Reference to the ENGRAVING *of Mr.* CURWEN'S DRILL HORSE-HOE *or* WEED HARROW. *Plate* I. *Fig.* 1, 2.

Fig. 1. Shews the carriage within the shafts A, of which the horse is placed: the carriage wheels are intended to be half the width of the butts or stitches, so that once going up and once returning will be sufficient to clear each butt from weeds.

B, The hoe or harrow which is attached to the carriage by the chains C C. The harrow may be raised higher or sunk lower, or placed more on one side or another, as occasion may require, by altering the position of the chain, as will appear by an inspection of the plate.

D D D D D D, Six double rows of teeth or knives which are so placed in the frame that each double row may pass up the interval betwixt the rows of corn, and cut or pull

up

up the weeds that grow in such intervals without injuring the corn. These knives are strong, andhave a sharp edge in front.

E E Are the two handles by which the person who holds them may direct the knives or teeth of the harrow to pass in straight lines up the intervals.

Fig. 2. shews the underside of the weed harrow, that the positions of the double rows of the knives, and of the space left to prevent the corn being injured may be more clearly seen.

Certificates in favour of Mr. Curwen's Harrow.

At the request of J. C. Curwen, Esq. I beg leave to state that I have been present when Mr. Curwen's harrow for cleaning drilled corn has been used, and have worked a little with it myself; that its effect appeared to me most highly beneficial in clearing away in the spring all the weeds that had grown during the winter amongst the wheat, without the least injury to the grain; and also in raising up the top soil which had become sad and heavy, and thus enabling the spring shoot to take root more easily: and at the same time it covers the roots of the corn with fresh soil, which are often left quite bare by the washing of the rains in winter, and so subject to be killed by the frost; it also enables the farmer to sow his barley much earlier than he could broad-east, as it will both clear the corn previous to sowing the grass seeds, and afterwards harrow them in. Its utility in every respect appeared to me so very great, that I was induced to adopt the plan of sowing my corn with the drill upon my fallows this spring, and have ac-

cordingly got a harrow made upon the model of Mr. Curwen's.

I have the honour to be, &c. &c.

J. D. B. DYKES.

Dovenby Hall, May 18, 1806.

SIR,

We whose names are hereunto subscribed do certify, that we have paid particular attention to a harrow made use of in the farm of J. C. Curwen, Esq. for the purpose of harrowing between the rows of drilled grain. We conceive it of great utility; the expedition is undeniable, as upwards of seven acres can be done with ease in eight hours, with only a boy to lead the horse and a man to regulate the harrow.

We are, Sir,

Your most obedient humble Servants,

Thomas Gaff, Merchant, Workington Hall Mills.

Matthew Foster, Farmer, at Calva, near Workington.

Workington Hall, May 19, 1806.

To C. Taylor, M. D.

The Drill Culture *of* Turnips *having in this and several preceding Sessions been found superior to the* Broad-cast *Method, the following Account of a* Useful Drill Hoe Harrow, *communicated to the Society by Mr.* Charles Waistell, *No.* 99, *High Holborn, will probably complete the Subject, and render it unnecessary for the Society to offer further premiums for the comparative* Culture *of* Turnips.

DEAR SIR,

I have ordered a new agricultural implement to be left for a short time at the Society's Repository for inspection. It is called a hoe harrow, and is, as its name imports, a hoe

and

Mr. Curwen's Weed Harrow.

Fig. 1.

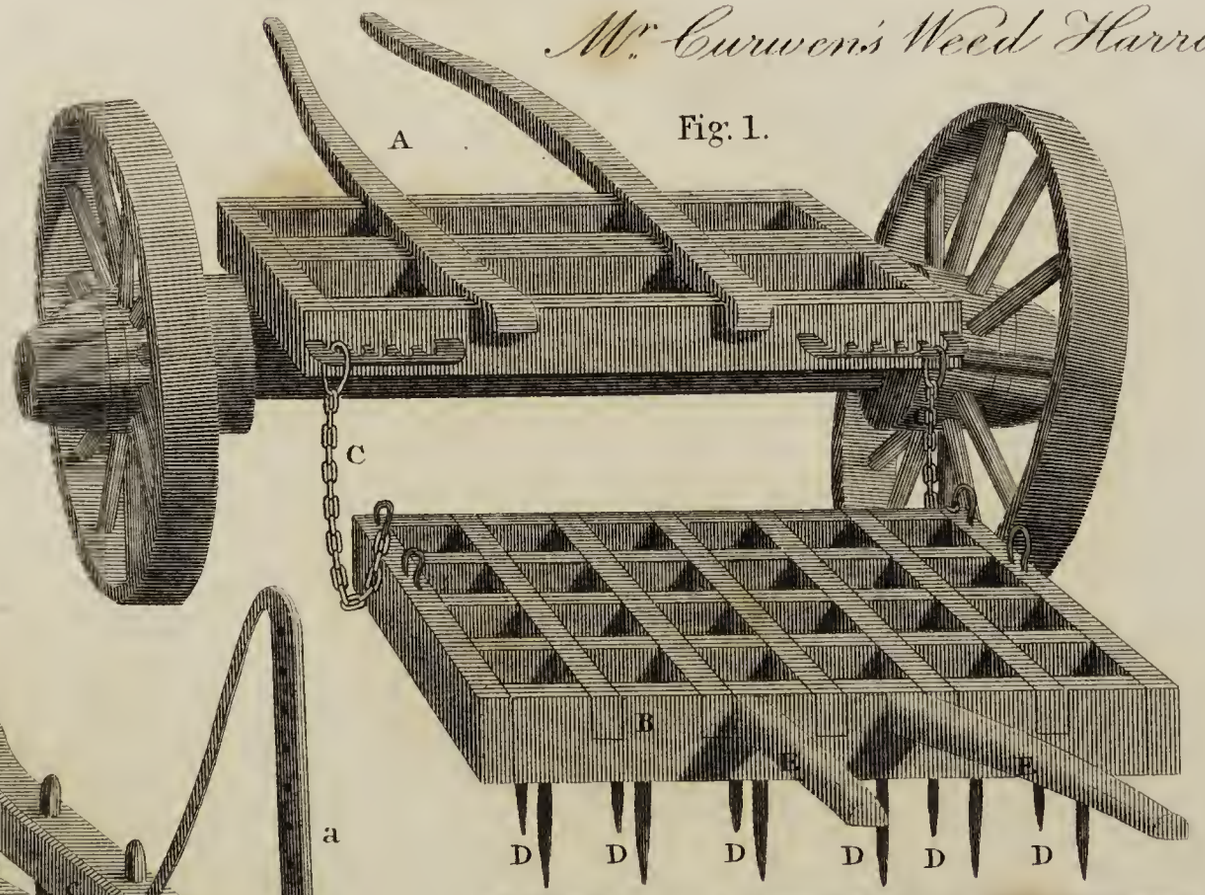
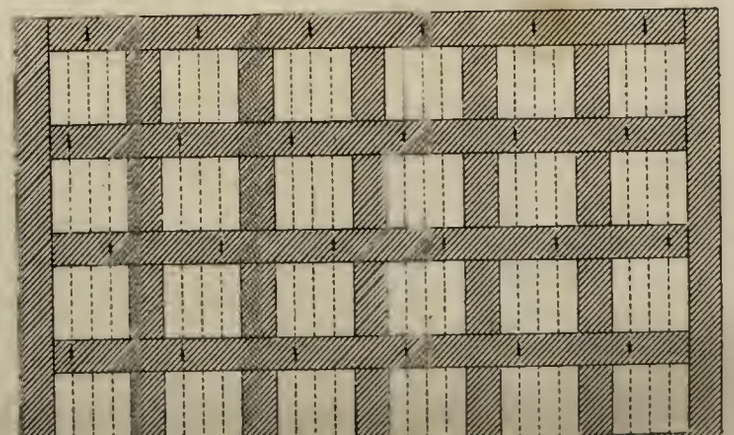


Fig. 2.



Mr. Waistell's Horse Hoe.

Fig. 3.

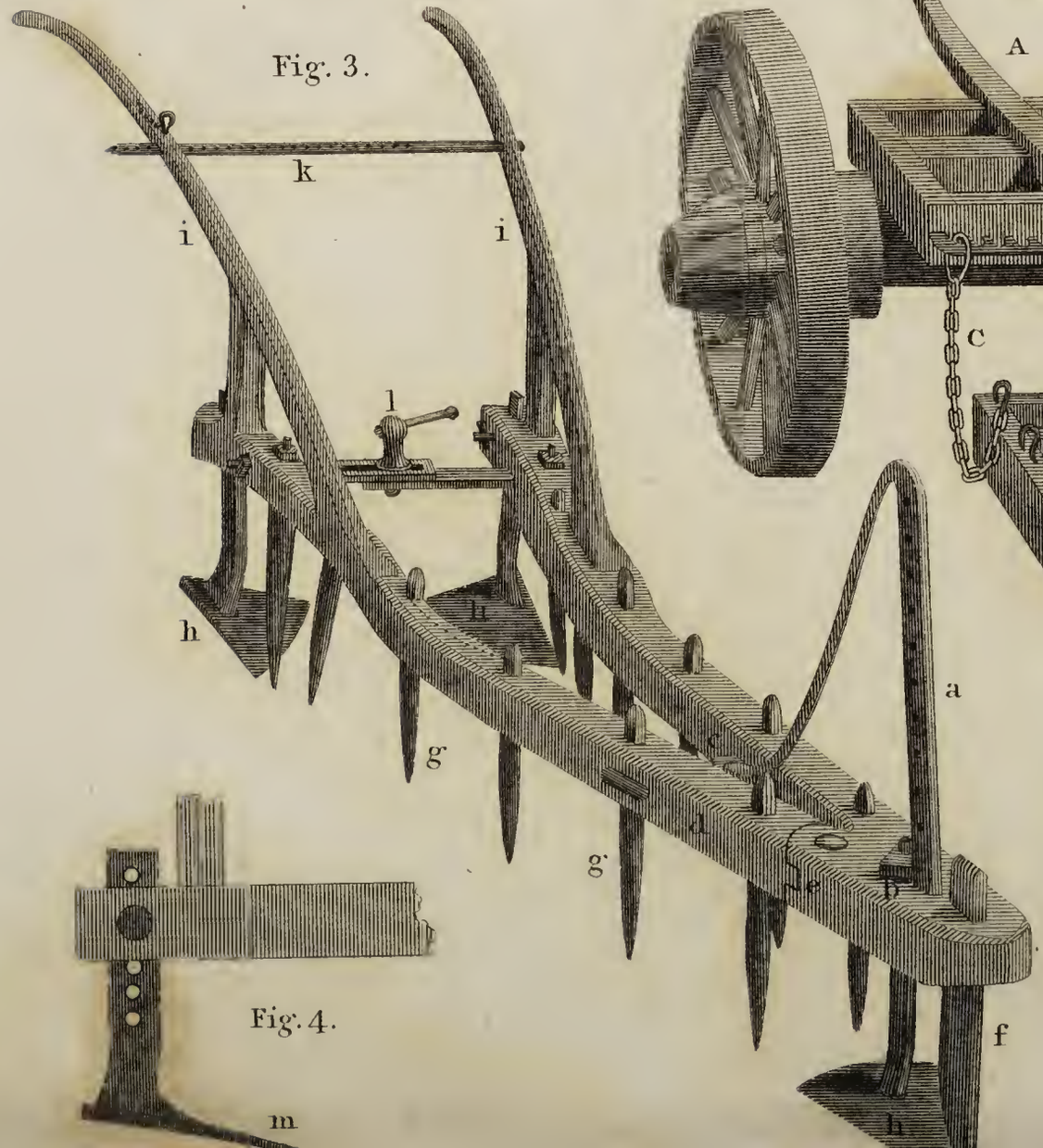


Fig. 4.

and harrow combined. For destroying the weeds, and pulverising the soil in the intervals of drilled turnips, and of other crops drilled sufficiently wide to be horse-hoed, I know not of any other implement of equal efficacy.

It enables the farmer to cultivate those intervals as completely as a well wrought fallow, so long as the horse can travel therein, without injury to the growing crop. I know not who the meritorious inventor is. The first I saw was a few years ago at West Park, near Barnard Castle. This was brought from Carlisle by my brother, and many have been made from that pattern, and are now in use, and are highly approved of by farmers in the neighbourhood of Barnard Castle, where the turnip crops are now generally raised in drills about 27 inches apart. This mode was first introduced there about 23 years ago, before which time they were all sown broad-cast.

An implement of husbandry, possessing such superior utility, as this hoe harrow seems to me to possess, is deserving of being made known as generally and as speedily as possible. I conceive this would be best effected through the medium of your respectable Society, to whose notice I must entreat you to have the goodness to introduce this implement. Should they concur in opinion with me respecting it, I am persuaded that they will give a plate and description of it in their next volume.

Convinced that the fertility and productiveness of our arable grounds may be much increased by a more general practice of the horse-hoeing husbandry, I wish to see the practice of it advanced more nearly to perfection, as that must tend to promote its more general adoption.

I am, Dear Sir,

Your very humble Servant,

CHARLES WAISTELL.

No. 99, High Holborn.

To C. TAYLOR, M. D.

Secretary to the Society of Arts,
Adelphi, London.

Reference to the ENGRAVING *of Mr.* WAISTELL'S *Drill Horse Hoe Harrow,* Plate I. Fig. 3.

Fig 3. shows the hoe harrow to which the horse is to be attached by the upright iron *a,* in which are a number of holes to admit the drag chain to be put higher or lower as may be found necessary. This iron is at one end fixed firm in the fore-part of the machine at *b,* and at the other end to the further side or wing *c.*

d Is the nearer side or wing of the machine, and moveable by a joint at *e.* This wing may by this mean be expanded or contracted, as the interval between the rows to be cleared of weeds may require.

f, A strong wedge-like tooth in the fore-part of the machine to tear up the weeds, which are deep in the ground.

g, g, Other teeth more slender, fixed in the two wings or sides of the machine, and which are also intended to tear up weeds, and loosen the earth.

h, h, h, Three triangular hoes. That which is in front has a strong iron fixed in its centre; the two others at the hinder part of the machine have the irons fixed at the further corner of each. The intent of the centre hoe is to cut off the weeds on each side next the crop, and to lay all the weeds in a ridge-like form in the middle of the path, to dry and rot.

i, i, The two handles, by which the machine is managed.

k, A slender iron bar, with a peg and holes to direct the distance of the expansion or contraction of the machine.

l, A strong iron vice, which works in a grooved iron, fixed to the inner side of the wing *d,* and which, when screwed down, holds the machine firm at the distance of expansion wanted for use.

Fig.

Fig. 4. Shows on a larger scale one of the hinder hoes separate from the machine, and the manner by which it may occasionally be raised or lowered in the machine by a pin and holes.

The GOLD MEDAL *of the Society was this Session adjudged to* RICHARD PHILLIPS, Esq. *of Tyn-y-Rhos, near Oswestry, for* IMPROVING WASTE-LAND.—*Class* 45.

The following Accounts and Certificates were received from him.

SIR,

IN the year 1804 the waste lands in the township of Bron-y-garth, in the parish of St. Martin in Shropshire, were divided and allotted by an agreement entered into by the proprietors of land, without any application to Parliament.

This township is separated from the county of Denbigh by Offa's Dyke, the boundary in ancient times between the kingdoms of Mercia and Wales: the boundary here, as in other uncultivated parts of the demarkation, still remains entire, after a lapse of 1000 years. Upon the ground, where the improvements detailed in my paper to you are made, the descendants of the ancient Britons fought for their independence, and for what remained of their territories. Upon this spot the bands of Henry II. headed by that monarch himself, were foiled in the battle of the Ceiriog by Owen Gwenydd, at the head of his brave Welshmen. The township on the west of Offa's Dyke, is called *Crogen*, i. e. *a place of graves*, because there the slain, who had fallen in battle, were buried. The posterity of the two, once hostile, nations, now contend which shall excel most in the arts of peace. This rude soil is now no longer fertilized by the blood of warriors, but by the

united labours of Englishmen and Welshmen. The dyke is still pretty accurately the line which separates the two languages: Welsh is generally spoken on the western side; English on the eastern. The hills, of which these wastes form a part, are at least as high as any in the county. Mr. Archdeacon Corbet, in his account of the agriculture of the county of Salop, asserts, that the hills near Oswestry are the highest in Shropshire.

The lands in question are part of the same chain which composes the skirts of the Berwyn, a mountainous tract, extending widely over the west of Denbighshire, and the contiguous part of Merionethshire. As a traveller approaches this country from Shrewsbury, a line of highly elevated ground presents itself to his view, extending from near the Severn to the neighbourhood of Wrexham. This ground once formed the rampart of Wales, though now cultivation in several of its parts is softening the roughness of its aspect.

The continuity of the line of hills is broken by two principal valleys; the larger is that of Llangollen, through which the Dee flows: the other is watered by the stream of the Ceiriog. One part of the Bron-y-garth enclosure looks over the last-mentioned valley, and has a northern aspect; the other looks to the east, over the plains of Shropshire.

Lime is found in every part of the line which divides the mountains from the plains, on the frontier of North Wales. The beds of lime-stone in some places lie on sand-stone, and in other places are found below it. In others again the lime-stone is near the bottom of a hill, sand-stone occupies the middle space, and lime-stone is again found upon the summit.

In some respects the sand-stone works well, and is of a superior quality, as the aqueducts over the Dee at Pontcysyllty, and that over the Ceiriog at Chirk, sufficiently prove.

The

The sand-stone in the quarries, which furnished materials for building those aqueducts, is perhaps equal in beauty and durability to Bath or Portland stone; and the lime-stone, at least in one quarry near Oswestry, becomes a beautiful black marble. In the lands, spoken of below, the lime-stone supplied me with manure, and the sand-stone forms the larger portion of my fences.

The paper, which accompanies this letter, is drawn up in haste, because it was only very lately that I determined to be a candidate for the notice of your honorable Society. But all the parts are faithfully and accurately stated.

I am, Sir,
Your most obedient Servant,
RICHARD PHILLIPS.

Tyn-y-Rhos, near Oswestry, Jan. 1806.

To C. Taylor, M. D.

An Account of the Improvement of more than Ninety Acres of Land lying waste.

In the year 1804 a large quantity of waste land was divided and allotted in the township where I live, on the borders of North Wales, by private agreement. I became possessed, as proprietor, of 70 acres of these lands. I obtained 50 acres more by two leases, each for 21 years.

The wastes consisted of two divisions. The first was a piece of common land, surrounded by old enclosures. This portion, though raised far above the general level of the country, is much less elevated than the larger tract hereafter to be described.

The portion of this waste allotted to me was 8 acres. The grass produced, while the land was in its natural state, was a sour rough sort. It afforded pasture in the summer to a few

few cattle, horses, and sheep. The coldness of the soil, and the consequent bad quality of the grass, gave this common the Welsh name of *Rhos*, a name which implies a tract of moist land, produciug a coarse sour herbage.

1. I began my improvements upon this allotment, because it lay near my house. The fence is a bank four feet high from the bottom of the ditch, with a double rail at the top. A double row of quick is planted upon the top of the fence, to supply the place of the rails when they decay.

The surface soil is about 6 inches deep, with a substratum of bad yellow clay. The first ploughing was in June 1804. It was cross-ploughed and harrowed in August; ploughed a third time about the 20th of September; manured about the end of the same month with 1690 bushels of lime, amounting to about 211 bushels an acre; ploughed a fourth time in the middle of October, in small butts or ridges; sown and harrowed. This operation of ridging was peculiarly necessary here to carry off the surface water, which had formerly greatly injured the land. Twenty-four bushels of Devonshire wheat were sown: the return was about 240 bushels (30 bushels an acre). The crop was one of the finest in the county. The expenses, as appear by the subjoined table, were £.88 19*s*. 1*d*. The wheat was worth last month £.130. The balance in my favour is £.40 0*s*. 11*d*. (£.5 2*s*. 7*d*. an acre.) This land in its natural state was not worth five shillings an acre. When it is laid down in grass it will be worth 40*s*. an acre.

In the beginning of October 1805, the stubble was harrowed off, and conveyed to the farm-yard. The land was then ploughed, sowed with 24 bushels of wheat, and harrowed as the year before. This is not my usual course of crops; but it was thought that old common land could not very easily be exhausted, and I was tempted to take another crop of wheat by the high price of corn, and by the circum-

stance

stance of the land being for four years tithe free. The corn now, the 12th of January, is coming up in abundance.

It is my intention to lay down this lot with grass seeds, to be sown with oats in the spring of 1807. Oats I conceive to be the best grain for the next crop, because the land is not dry enough for turnips and barley.

The second, and much larger, division of lands lying waste extended along the side, and reaches the summit of a hill, which is equal in height to any in this county. The aspect is, for the most part, north and north east. A mountain torrent runs though the midst of this tract: some of the lands on one side of this torrent are more sheltered, and have a southern aspect.

Lime-stone is found on the lowest part of this waste, not far from the bed of a river: but the steepness of the ground above would have been too formidable an obstacle to the cultivation of the higher lands, had not lime-stone been discovered upon a spot so elevated, as to enable the improver to convey his manure, at a comparatively light expense, to the lands below.

The coals indeed, for burning the lime, are brought up a steep hill, a distance of four miles. The ascent up which they are conveyed, enhances considerably the expense of the manure.

Upon this waste the lime-stone is at the bottom of the hill, and fortunately upon the top also. The substratum, at no great distance from the surface, is sand-stone, in some places hard, in others loose, and less useful for fencing; a purpose to which I have applied it in dividing most of the enclosures.

All the waste lands allotted to me as proprietor, or occupied by me as tenant, in consequence of the two leases mentioned above, were covered for the most part with *gorse*, (Ulex Europæus,) in some parts of England called *furze*.

Some

Some more favoured spots produced fern alone; and others were much encumbered with stones. The stones were carted off the lands to assist in making the fences; and those, which were too small for this purpose, were used to fill up large holes in various parts of the land.

The thin soil upon these wastes seems to have been created by the annual decay of portions of the gorse; a plant admirably calculated to produce, and afterwards to detain, in spite of rains and storms, the vegetable earth upon these steep declivities. Around each bush of gorse is always found a heap, more or less high, of excellent soil; and so completely do the prickles of this plant defend the grasses, that grow among it, from the attacks of sheep, that the earth, produced by the successive decay of vegetable matter, accumulates, and renders lands, which a few centuries ago would probably have been unproductive, proper for the growth of corn.

It is impossible to traverse our mountains without observing how wisely these things are contrived by Him who provides for us all.

The highest mountains of North Wales, where the rock does not every where appear, are clothed with heath. As ages roll by, the soil, produced by the annual decay of portions of the heath, becomes fit to produce gorse. If the water has a ready fall, and the land is dry, gorse appears in abundance on the more exposed sides of the mountains. Where soil has accumulated in sufficient quantities, the next protector and fertilizer of the mountains is fern. Wherever this plant flourishes, still richer quantities of vegetable earth are every year added to the surface soil, and the ground is rapidly prepared for the plough.

Let me be excused for having made this digression longer than I intended.

I now

I now proceed to state the operations performed upon the second portion of waste land improved by me.

2. One close of 21 acres, for which I have a lease for 21 years, at 10*s.* an acre, is so steep, that no waggon or cart can be used, to carry off the crop; drags must be employed for this purpose.

This land was so steep, and was encumbered with such a quantity of stones, that a respectable gentleman farmer, whose lands are contiguous to it, and to whom it was offered in exchange for other lands, declared he would not cultivate it if it were given him as a present. I should observe, that it was stipulated in my lease, that the landlord was to be at the whole expense of fencing.

The greater part of this land was begun to be ploughed for me in December 1804 by a neighbouring farmer at 20*s.* per acre. It was at first ploughed one way. The steepness of the ground made it necessary for the horses to drag the unencumbered plough to begin the furrow again upon the "vantage ground." Two acres of it could not at first be ploughed at all. Hand labour was here employed.

The difficulty of ploughing proved so great, that I thought it right to make some addition to the stipulated price of 20*s.* an acre. It was harrowed in June 1805. The whole of the field was cross ploughed in July; harrowed and manured in August with 5200 bushels of lime, about 250 bushels an acre. The quantity of lime generally used in this country is about one-fourth less than this. The lime was carted in small quantities, and laid upon the land with the assistance of three men with each team. So many men were necessary on account of the unevenness of the ground.

The fence, made at my landlord's expense, consists of a wall six feet high, 20 inches broad at the base, and 14 at the top.

top. It is to be pointed next summer with mortar. The materials were partly stones collected in the field, and partly sand-stone obtained from a quarry, opened for this purpose in an allotment to be described hereafter. The fencing is mentioned in this place, because it was in this part of the process that the stones were collected off the land. The land was ploughed a third time the first week in October; sowed with wheat, and harrowed. Three ploughings were thought sufficient for this land, because the soil is light and ragged. The depth of soil is here near eight inches. The substratum is a light yellow *rammel*, called in this country *cat-brain*. The sand-stone, which lies next below, does not appear near the surface, except in one small part of this field. The wheat sown was 71 bushels, above three bushels an acre. This large quantity of seed was thought necessary, on account of the lightness of the soil, and the exposed northern aspect. These plants now (January 12) look healthy; they are of a good colour, and equal in appearance and promise of a good crop to the wheats upon the best lands in the neighbourhood.

3. I obtained a like lease for 21 years of another lot of 12 acres from the same landlord at 10*s*. an acre. I may here remark, that by an error in laying out a road, nine and a half acres of this field belong to my landlord, the other part to me as proprietor. But the close is at present undivided, and the whole subject to the same management. The aspect is here S. E.; but the situation is much higher than that of the last mentioned lot.

This lot, like the last, was, by the terms of my lease, to be fenced by the landlord; but all the fences have been made under my superintendance. The whole fence would have been a wall, but the sand-stone rock on this part of the hill failed. Twenty-six roods are fenced with a stone wall, six feet high. Sixty-seven roods are fenced by a bank and ditch,

ditch, faced on one side with stone, and protected above by posts and double rails. Upon the top of the bank hawthorn quick is set. Fifty-eight roods more, which complete the enclosure, are bounded by a very high old dyke. This boundary, however, is of such a sloping form, that some additional defence was necessary. A ditch is therefore sunk on the summit of the dyke, to the depth of five feet; in this are planted strong *staggers*, as they are here called, consisting of hazle, holly, thorns, and horse briers*.

The first ploughing was in February 1805: it was done by my own teams. We used four horses in each team. I will remark here, by the way, that my own teams ploughed, the first time over, all the lands which I have improved, except the last mentioned lot of 21 acres; and that the expense for oats only given to my horses the first nine months of my improvements was 70*l.* This lot was harrowed the beginning of June. The second ploughing was in July by hired teams; it was harrowed the second time in the beginning of September; limed with 3250 bushels of lime, allowing about 270 bushels to each acre. It was sown in the middle of October with 40 bushels of wheat, and harrowed. The wheat plants are come up in abundance, and look as healthy and promising as wheat on any lands in the country.

It has already been remarked, that upon these light loose soils, it is necessary to sow a larger than usual quantity of seed by the acre. The soil is here about nine inches deep, but remarkably loose and light. The substratum above the sand rock is the same rammel or cat brain, which is found under most of these wastes.

4. I obtained from another landlord a lease for 21 years of two other allotments, amounting together to 20 acres. By

* So called, perhaps, because they are an excellent fence, when mixed with other underwood, against horses as well as sheep, and other animals.

the

the terms of my lease I am to pay no rent for the first seven years; for the remaining fourteen years the rent is to be 14*s.* an acre. The tenant is to make the fences at his own expense.

Sixty roods of the fence round the first of these two lots, which consists of 12 acres, is a stone wall six feet high; 30 roods, a strong ditch and bank faced, as in the last lot, with stone, and protected above with posts and a single rail. On the summit of the bank hawthorn quick is planted. A single rail was here thought sufficient, because it is a fence between two closes, not between a close and the road.

The first ploughing was in September 1804; this was the first lot after the Rhos above mentioned, upon which I employed my own teams. It was harrowed early in May 1805; cross ploughed in the beginning of June; harrowed immediately; limed in the same month with 3250 bushels of lime, the same quantity as in the last mentioned lot; ploughed a third time, and sown in the end of October, and harrowed. The quantity of wheat sown, as in the last lot, was 40 bushels. The soil is here partly sand upon the sand rock, and partly a light soil upon rammel. Hand labour was employed at a great expense upon a stony part of this lot, in quantity about three acres. The wheat plants upon this lot are of as promising an appearance as upon either of those above described.

5. The other lot of 8 acres, obtained by the last mentioned lease, is not yet enclosed. The labourers are now (13th January) employed upon the fence. It was ploughed in January 1805, and harrowed in the same month. It is now a fallow intended for pease. This lot would have been prepared for wheat and sown; but lime, in sufficient quantities for all my improvements, could not this year be obtained, at the only rock from which it could be conveyed at any reasonable expense to these lands.

I was

I was induced to offer the rents above stated of 10*s*. and 14*s*. an acre (in the last case, the land to be for seven years rent free) because I was confident, that these wastes were capable of improvement. But in the natural state in which I found them, they were not worth 2*s*. an acre. They afforded pasture to a few half-starved sheep of the worst Welsh breed; and the sheep did more damage to the fences of the old enclosed lands in winter, and to the lands themselves, than could be compensated for by the profits, which their owners derived from them.

The closes now fenced and improved, are well worth a guinea an acre. A year ago they were not worth two shillings.

The improvements upon the first four lots, above described, are to a certain degree complete. They contain fifty-three acres of as fine green wheat, as any which this country contains.

6. A sixth close of thirty-two acres, allotted to me as proprietor, is fenced with a wall six feet high, and one hundred and ten roods in length: most part of the wall is pointed with mortar on the outside; the rest is to be pointed next summer. The lower part of this allotment is bounded by the fences of my old enclosed lands. On the exposed side, towards the N. W. a plantation is intended fifty roods in length, and twelve yards in breadth.

This close was almost entirely covered with gorse. There was, as I stated above, much of this plant upon the lands already described. My first operation was to stock up the gorse. I gave my labourers three guineas for this work, upon this lot only. They were also to have the gorse for their own use, which was partly used for fuel, and partly sold by them. They sold it at 5*s*. the cart load. I made an experiment upon five acres of this close, where a plough could

could not at first be used. After the gorse was stocked off, the land was pared and burned; and the ashes were spread. The plough could, after the land had been thus treated, though with some difficulty, be used. I ploughed it in June, 1805; harrowed it; ploughed it three times more; and sowed it, about the end of the same month, with turnip seed. There is now upon the land a fair average crop of turnips.

I also pared three acres more. Part of this was burned, and part was manured with dung. Where the dung was laid, the ground was trenched about nine inches deep; the sod was placed with the surface downwards within the trench. The dung was laid in moderate quantities upon the sod, and covered with about six inches of soil. Potatoes were then set in the beginning of May in rows. They were hoed twice. The produce was abundant.

The remaining 24 acres of this inclosure, were ploughed in February and March, 1805. Fourteen acres were, after one ploughing, sown with 71 bushels of black oats; 11 acres with pease; and three acres with summer vetches. The ground was then well harrowed. I had little land of my old enclosures this year in oats. It was my wish to try, whether a crop of this grain might be obtained, upon land so fresh and light as this, without manure, and with one ploughing. The first promise, however, of the oats, was so bad, when they began to appear above the ground, that I thought it best to throw some lime upon the land; which, if not so beneficial to the crop of oats, will be useful to any succeeding crop. I therefore manured 18 acres; viz. all the land where the oats were sown, and part of that sown with pease, with 4550 bushels of lime.

I obtained from the 71 bushels of oats, a return of 360 bushels; a clean, thin crop, intermixed, indeed, with a little fern. The pease and vetches produced but a poor return. In

In the beginning of November my teams were not much employed. I sent them to try how this land would appear when ploughed up. I found the part which had been limed, remarkably mellow. I conceive that this favourable appearance, arose from the length of time that the lime had been upon the ground. I then procured several hired teams in addition to my own. It was all ploughed up by the twentieth of the same month; sown with 95 bushels of wheat and harrowed. The potatoe land was sown with wheat, at the same time. The six acres, which had not been limed, are to be manured with 240 bushels of soot. The soot is now in waggons upon the ground; and the first favourable day, it will be thrown upon the land as a top dressing.

This is the last field sown by me. The wheat plants are now (January 13) making their appearance above ground, and look well.

I intend this year to proceed with activity in the improvement of the following allotments, which still lie waste.

7. and 8. One of these lots of 25 acres I obtained in exchange for four acres and a half of old enclosed, arable land, detached from my farm, of much the same quality with other arable lands in this neighbourhood. This circumstance alone proves of how little value these waste lands were. These 25 acres were an object to me, as they lay contiguous to another of my allotments; and they are equal in goodness of soil to any upon this hill. After this land has undergone the process described in lots 2d and 3d, I hope to see these 25 acres of equal value, acre by acre, to the four and a half which I gave for them.

These 25 acres, as well as lot 8, 27 acres, allotted to me as proprietor, will be improved next summer.

9. Three acres of steep ground, that can never be cultivated, will be planted, this spring, with different kinds of forest trees.

The tables of expenditure are below. The return in the first lot has more than repaid all my expenses the first year; and the return promised by the three succeeding lots, is little less abundant.

If I am permitted to live another year, and to enjoy my usual health, I hope to see 148 acres of land, which was so lately almost intirely unproductive, covered with golden harvests, or adorned with thriving plantations.

LOT I.—8 Acres.

		£.	s.	d.
	1804.			
64	roods of fencing, at 7*s*. per rood.....	22	8	0
1	gate and posts.....	1	1	0
1690	Winchester bushels of lime, at 2½*d*. per bushel..	17	12	1
	Carriage.....	5	4	0
	1st ploughing, 20*s*. per acre.....	8	0	0
	2d ditto..... 15*s*. per do.....	6	0	0
	3d ditto..... 10*s*. per do.....	4	0	0
	4th ditto..... 10*s*. per do.....	4	0	0
3	separate harrowings, at 15*s*. per acre—5 acres..	6	0	0
24	Winchester bushels of wheat, at 11*s*.... do.....	13	4	0
	Labour.....	1	10	0
	1805.			
1	ploughing and harrowing, at 15*s*. per acre.....	6	0	0
24	Winchester bushels of wheat, at 11*s*.	13	4	0

LOT II.—21 Acres—Fenced by Landlord.

85½	roods of stone walling, at 17*s*. per rood.....	72	13	4
3	gates, at 1*l*. 1*s*. each	3	3	0
5200	Winchester bushels of lime, at 2½*d*. per bushel ..	54	3	4
	Carriage.....	10	0	0

1st

		£.	s.	d.
	1st ploughing at 20s. per acre	21	0	0
	2d ditto .... at 15s. per do.	15	15	0
	3d ditto .... at 10s. per do.	10	10	0
3	separate harrowings, at 15s. per do.	15	15	0
71	Winchester bushels of wheat, at 11s. per bushel	39	1	0
	Labourers for stocking, levelling, clearing stones, and spreading lime.	15	5	2

LOT III.—12 Acres—Fenced by Landlord.

26½	roods of stone walling, 6 feet high, at 17s. per rood	22	10	6
67½	roods of fencing, with stone face, and double posts and rails, and hawthorn quick, at 10s. per rood	33	15	0
58	roods of sunk fence, 5 feet deep, and staggers on the top along the dyke, at 4s. 9d. per rood	13	19	6
2	gates and posts, at 1l. 1s. each	2	2	0
	1st ploughing, at 20s. per acre.	12	0	0
	2d ditto,.... at 15s. per do.	9	0	0
	3d ditto,.... at 10s. per do.	6	0	0
3	separate harrowings, at 15s. per acre	9	0	0
3250	Winchester bushels of lime, at 2½d. per bushel	33	17	1
	Carriage	6	5	0
40	Winchester bushels of wheat, at 11s. per bushel.	22	0	0
	Labourers, for stocking, levelling, and spreading lime	8	3	0

LOT IV.—12 Acres—Fenced by Tenant.

60	roods of stone walling, at 15s. per rood	45	0	0
30	ditto of fencing, with single posts and rails, on top, with hawthorn quick, at 9s. 4d. per rood.	14	0	0
2	gate and posts, at 1l. 1s.	2	2	0
	1st ploughing, at 20s. per acre	12	0	0
	2d ditto, ... at 15s. per do.	9	0	0

		£.	s.	d.
	3d ploughing, ... at 10s. per acre	6	0	0
3	separate harrowings, at 15s. per do.....	9	0	0
3250	Winchester bushels of lime, at 2½d. per bushel	33	17	1
	Carriage	6	5	0
40	Winchester bushels of wheat, at 11s. per bushel	22	0	0
	Labourers, stocking, levelling, clearing, and spreading lime	14	8	6

LOT VI.—32 Acres.

110	roods of stone walling, 6 feet high, at 17s. per rood	93	10	0
6	ditto of fencing, at 9s. 4d. per rood	2	16	0
3	gates and posts, at 1l. 1s. each.....	3	3	0
	1st ploughing, at 20s. per acre.....	32	0	0
	2d ditto,..... at 15s. per do	24	0	0
2	separate harrowings, at 10s. per acre	16	0	0
4550	Winchester bushels of lime at 2½d. per bushel...	47	7	11
	Carriage	8	15	0
71	bushels of oats, at 3s. 4d. per bushel.....	12	7	0
24	ditto of pease, at 5s. per bushel	6	0	0
8	ditto of summer vetches, at 6s. per bushel.....	2	8	0
240	ditto of soot, at 6d. per bushel.....	6	0	0
	Sowing the same, at 5s. per 100 bushels.....	0	12	0
95	Winchester bushels of wheat, at 11s. per bushel	52	5	0
	Paring and burning 5 acres, for turnips, at 1l. 16s. per acre	9	0	0
2	extra ploughings, at 20s. per acre.....	5	0	0
2	ditto harrowings, at 10s. per do.....	2	10	0
	Spreading the ashes at 2s. 6d. per do.....	0	12	6
5	pounds of turnip seed, at 1s. per pound.....	0	5	0
2	hoeings, at 7s. per acre	1	15	0
150	roods of 8 yards square of stocking, at 1s. per rood, for potatoes	7	10	0
	Paring 3 acres, at 1l. 6s. per acre.....	3	18	0

La-

	£.	s.	d.
Labourers for clearing the gorse.....	3	3	0
Ditto levelling and spreading the lime.....	5	15	0

LOT V.—8 Acres—A Fallow for Pease;
One Acre waste.

1st ploughing, at 20*s*. per acre.....	7	0	0
Harrowing, at 5*s*. per do.....	1	15	0
Total Amount £.	1073	1	0

The accuracy of the foregoing facts, and particulars, detailed by Mr. PHILLIPS, are attested by

J. W. BOURKE, Vicar of St. Martin's.
P. M‘ KIERNAN, Churchwarden.
JAS. DONNE, Vicar of Llanyblodwel.
C. MORRALL, Bellmont.
W. MORRALL, Dynbran Hall.
RICHARD CROXON, Oswestry.

The SILVER MEDAL *of the Society was this Session voted to* Mr. WILLIAM CHEETHAM, *of Mellor-Moor, near Chapel-in-le-Frith, Derbyshire, for* CULTIVATING WASTE LAND; *which was bestowed as a Reward for the* LAUDABLE INDUSTRY, *exhibited in bringing this Land into Culture, and not for an Approbation of the particular Rotation of Crops adopted by him.*

SIR,

I HAVE taken the liberty of transmitting through your hands, to the Society for the Encouragement of Arts, &c. a detailed account of Improvements in Waste Land.

Mellor-Moor, Jan. 27, 1806. Yours respectfully,

C. TAYLOR, M. D. W. CHEETHAM.

In the year 1781 I purchased 11 acres of common waste land, a part of Mellor Moor in the county of Derby, for which I gave 51*l.* 1*s.* It was intirely uncultivated and uninclosed. I first inclosed the spot with a stone wall five feet three inches high, which cost me about 1*s.* per yard. I next built two cottages on the land, which cost me 120*l.* I then pared the land, not by a machine and horses, but by manual labour; for it is impossible to effect it in any other way, so very stony and rough was the surface: the expense of this was about 18*s.* per acre. The next operation was that of burning, which I also performed myself. I then spread the ashes, and covered them with lime, at the rate of 100 loads per acre, of 10 pecks to the load. I then ploughed and sowed the land with oats, which yielded a good crop. The expense of ploughing was more than double that, which was incurred by my neighbours, whose land was in proper condition; and the harrowing, on account of the peaty nature of my land, was of thrice the usual expense, for with less labour a sufficient quantity of mould could not be procured to cover the grain.

Immediately after the crop was got in, I again ploughed the land, and left it in that state till the following spring, when I sowed it with oats as before, and found that by ploughing in the autumn I saved much labour in the harrowing, since a single harrowing was sufficient. From this sowing I had an extraordinary good crop.

In the following spring I ploughed the land again, and sowed oats and hay seeds: the oats yielded nearly as before. I then divided the land into three closes by a stone wall four feet high; two of which closes are now good meadow land, and the other pasture, which, with the above cottages, are now let for 20*l.* per annum clear rent.

2. In 1783 I purchased 88 acres contiguous to the former parcel,

parcel, and comprised in a ring fence of stone five feet three inches high; for this allotment I gave 360*l.*

About two acres of this land I turned over with the pick-axe and spade; for the irregular surface which it presented forbade the use of a push-plough. I then set potatoes, and had a tolerable crop; after which I sowed barley, which yielded remarkably well. Twelve acres more I pared, burned, and limed, as the first mentioned parcel, and at about the same expense. I ploughed them in September, and suffered the land to remain so till the following summer, when I sowed it with turnip seed, which gave upon the whole an indifferent crop. In the ensuing spring I again ploughed it, and sowed oats, which yielded an excellent crop. On the two following years I repeated the same crops, with as good success as before.

I now ploughed this portion of land with the other two acres, and sowed the whole with hay seed. I then divided the same into two closes by a stone wall four feet high. One of the closes is meadow land, containing about three acres; the other is pasture land. On this plot I built a house, and have let it, with the 14 acres, for £.35 per annum clear rent.

3. My next work was to fence five more acres with a stone wall as before. I pared, burned, and limed the land as in the last parcel; and after ploughing, sowed it with oats, which yielded a good crop. The following year I repeated the same, mixing hay seed with the oats, and had as good a crop as before. These five acres are now as good meadow land as any in the neighbourhood. Upon this plot I built a house and out-buildings, which I occupy myself.

4. I next pared, burned, and limed other 16 acres, which cost about the same as the first; after which I ploughed and sowed the land with oats three years successively. One

half of the land yielded every year a particularly good crop; the other not so good, owing, I believe, to that part of the land abounding with a gravelly kind of stone. The last time of sowing I mixed hay seeds as before. This plot is now divided into two closes by a stone wall like the others.

5. I then fenced in another plot of eight acres, using the same process as before; and, after ploughing and sowing the same with oats and rye-grass, had an excellent crop. These two last mentioned plots I also occupy myself, excepting what I let for £.10 per annum. Upon the remainder of which, and the five acres abovementioned, I have two milch cows, one heifer, three calves, two horses, and one colt.

I greatly prefer the method of paring, burning, and limeing, as well as ploughing in the autumn, to any other. Paring destroys the heath, with which the whole of the above land was covered at the first operation; besides it prepares the land, so that a team may come upon it in dry weather.

The first time of ploughing I could in general do as much with four horses in two days, as my neighbours, upon good arable land, could do with three horses in one day; and the second time about as much with four horses as they could with three in the same time.

I have made some experiments (upon small plots) of liming and manuring with black dung upon the heath, and found, that though the heath was eventually destroyed thereby, yet it required from seven to ten years for the effect, and even then only an indifferent pasture was made. Whereas by sowing oats and hay seeds, a good crop was produced the first year, and on the following a much better pasture was made than after the term of 10 years by the other mode. Upon the whole I prefer in peaty land ploughing four years successively. The first and second times of

ploughing

ploughing should be in the autumn; by which two-thirds, I suppose, of the labour in harrowing are saved, and the soil afterwards is as fit for ploughing, &c. as most others are, which have been in tillage a much longer time.

The difference in point of value between the meadow and pasture land is, I consider, in the proportion of four to one. The expense of liming at present is much greater than of late, from lime being now 16*d.* a load, while only a few years since it was much less.

I cannot say positively what was the expense of paring, burning, &c. as the whole has been done by the manual labour of myself and sons.

WILLIAM CHEETHAM.

Mellor Moor, April 25, 1806.

To C. Taylor, M. D.

A certificate of the truth of the foregoing statement has been received by the Society, signed by

M. Olerenshaw, Minister of Mellor.
Ralph Wood.
Ralph Bridge.
David Bridge.
Thomas Bowden, Assessor of the said land.
Thomas Olerenshaw, Constable.
Emanuel Wild, Overseer of the poor.
George Ferris.

The

The GOLD MEDAL *of the Society was this Session adjudged to* J. G. CALTHROP, *Esq. of Gosberton, Lincolnshire, for the* CULTIVATION *of* SPRING WHEAT,—*Class* 23.

The following Account and Certificates were received from him.

SIR,

I DO myself the pleasure of transmitting to you an account of spring wheat, which I have raised on an extent of 82 A. 14 P. of land in Gosberton Fen in Lincolnshire. The land has been inclosed nearly seven years.

I am, Sir, your obedient Servant,

J. G. CALTHROP.

Gosberton, January 18, 1806.

To C. TAYLOR, M. D.

The wheat was sown between the 25th of March and 6th of April 1805: but I have known wheat sown with great success as late as the 20th of May. It was reaped between the 1st and 14th of September.

The kind was the horned or rough eared spring wheat.

The land was ploughed once in broad ridges with the common Dutch plough; the seed was sown broad-cast; and the land was then harrowed twice with the single horse harrow.

EXPENCES.	£.	s.	d.		£.	s.	d.
Seed, 8 pecks per acre, 20 Qrs.	5	0	0	per Qr. .	100	0	0
Ploughing . . .	0	4	6	per acre .	18	9	0
Sowing . . .	0	0	6	per ditto .	2	1	0
Harrowing . . .	0	1	6	per ditto .	6	3	0
							Weeding

	£	s.	d.		£	s.	d.
Weeding . . .	0	1	0	per acre .	4	2	0
Leading . .	0	1	0	per quarter .	22	0	0
Stacking, thatching, & housing	0	1	0	per ditto .	22	0	0
Thrashing by machine	0	3	0	per ditto .	66	0	0
Boating to market .	0	1	0	per ditto .	22	0	0
					£.262	15	0

A.	P.	
42	14	Of the land is moor upon clay, and
40	0	moor upon sand.

The land was in a high state of cultivation: 51 acres 2 roods and 38 perches had borne turnips, and 30 acres 1 rood and 16 perches cole, the preceding year.

ACCOUNT OF THE PRODUCE.

Qrs.	ct.	st.		£.	s.	d.
413	1	3	Good wheat sold at 50*s.* per qr. . .	1034	13	9
26	1	2	Refuse or hinder ends 25*s.* per ditto .	33	8	9
440	1	1		£.1068	2	6

Weight was 16 st. 4 lb. neat per comb, or 57 lb. per Winchester bushel.

The Reverend *William Barnes,* minister of Gosberton, and Messrs. *William Dods* and *Henry Syson,* churchwardens and overseers of the poor, certified that the above statement by Mr. *Calthrop* was correct.

The GOLD MEDAL *of this Society was this Session adjudged to* MR. JOHN SHUCKFORD WADE, *of Benhall, in the County of Suffolk, for* PLANTING OSIERS: *Class* 12.

The following Account and Certificates were received from him.

SIR,

THIS is to certify that JOHN SHUCKFORD WADE, of Benhall in the county of Suffolk, did plant, between the first of October, 1804, and the first of May, 1805, the undermentioned

mentioned parcels of land, with upwards of 12,000 sets of osiers per acre, of the species called New-kind and French; which are now in a thriving state, and fit for basket-making, having been an osier grower for these last twenty years.

		A. R. P.	
In Benhall, Suffolk.	One Meadow . .	5 3 19	called Goodings.
	Part ditto . . .	0 3 0	. . . Farnham.
	One ditto . . .	4 0 32	. . . Barn Piece.
In Gedgrave, a hamlet to Orford, in the same county.	. . .	4 3 0	. . . Further Piece.
		15 2 11	

Certified by Rev. GEO. DINSDALE, Vicar.
JNO. ABLETT, Churchwarden.
JNO. ABLETT, Overseer,
THOS. POPE,
SAM. JOLLER, } Inhabitants.
FRANCIS WILBY, Basket-maker.

P. S. It may not be without use, to state some facts, with respect to osiers in our part of the country.

The names given to the osier plants which we cultivate are, *New Green Kind*, *Leathering Osier*, *French Rod*, *Mootely Rod*, and *Craneker*.

We plant the sets at a distance from each other, of 26 inches by 10. They generally grow best near our river.

The expense, as near as I can ascertain, for sets 9 inches long, from the but or largest part of the rods, is at least £.10 per acre; besides an additional expense of two guineas, for preparing the land in ploughing and harrowing, and in planting the sets.

In a quantity of land, a man will do well to make a net profit of £.10 per acre; for the plants are very subject to the depredations of insects. A brown bug attacks them, and this

this is followed occasionally by a black caterpillar, which makes them crooked, and entirely kills the top. I have had plants only knee deep, where previously they had been seven feet high. In order to net the sum I have mentioned, we must be nearly free from such ravages. New sets are continually required to replace such as fail. Upon the whole, then, I must consider £.10 as a full average net profit; under the proviso, however, of the price continuing what it is at present.

I had my osiers quite clean for the first two years. About eight years since I was obliged to stub up all my rods, or osiers, from the insects before mentioned being so numerous as to render them altogether unsaleable: even at this time I am not without my fears, such is the precarious state of osiers; though, as I have admitted, some years are more favourable than others.

Your obedient humble servant,

J. S. WADE.

Benhall, November 13, 1805.

To Dr. C. Taylor.

The Silver Medal, *or* Ten Guineas, *at the option of the Candidate, were this Session adjudged to* Charles Layton, Esq. *of Reedham Hall, in Norfolk, for his Comparative* Culture *of* Turnips.—*Class* 26.

Mr. Layton *preferred the honorary Reward.*

The following Communication was received from him.

SIR,

I beg leave to send you an account of an experiment on the comparative culture of turnips: and have the honour to be

Your very humble servant,

CHAS. LAYTON.

To Dr. C. Taylor.
Secretary to the Society of Arts, &c.

Being

Being desirous of ascertaining by experiment, the best mode of cultivating turnips, I prepared in 1805, 20 statute acres of land well calculated for such trial. The whole spot was level, and the soil similar in every part. By manuring it equally with ten cart loads per acre of rotten farm-yard dung, after it had been properly summer tilled, it was fit, by the 24th of June, for the reception of the seed. In order to make the experiment perfectly accurate, I divided the field, which is square, into ten equal parts, and sowed the whole of them alternately by drill and broadcast at the same time. The drills were 12 inches asunder. The seed was of the white-loaf stock, and I had the satisfaction to find that no part failed. The divisions were all of them hoed at the same time, and care was taken to set the plants, as well the broadcast as the drilled, 12 inches apart. The expense for the whole was 7*s.* per acre; but from the drilled plants requiring an extra man and horse per acre, beyond the broadcast, I estimate the relative expense as 8 to 7. Sixteen perches of each were set out and weighed by three respectable farmers and graziers, who reside in the parish of Reedham, where the experiment was made; and who have set their names to the certificate sent herewith.

A certificate in proof of the above account was received by the Society, signed by

JOHN BAKER.
DAN. COCKERILL.
RT. LONG.

The certificate also states that

	T.	ct.	st.
16 Perches of the drilled crop weighed . . .	1	19	0
Ditto . . . of the broadcast.	1	14	4
	0	4	4

Difference in favour of the drill, 4 Cwt. 4 Stone.

CHARLES LAYTON.

ReedhamHall, Norfolk, Feb. 27, 1806.

The

The Thanks of the Society were this Session voted to Mr. JAMES DEAN, *of Exeter, for the following Communication of the Method of* PRESERVING TURNIPS *in the winter Season.*

SIR,

WHEN surveying an estate in the South-Hams of Devon, in February last, my attention was attracted by the singular appearance of a crop of turnips in an orchard; so thick as to touch each other, and closely surround the stems of the apple-trees. I enquired of the farmer the reason of so unusual a crop, and I received from him some curious information. It was the constant practice, he said, in his neighbourhood, for farmers, after they had broken up ley ground, first to take a crop of turnips; and in the autumn, or rather winter, to sow wheat in the same ground. Should winter fodder be scarce, they then preserved the turnip crop for stock, and consequently could not put in wheat before January; and even then with no probability of having more than two thirds of an usual crop; because of the late sowing. This was an evil of great magnitude, and led him, he added, to make trial of a mode peculiarly successful, enabling him to sow his seed in the proper season, and to save the most valuable of his turnip crop during the winter.

He got, he said, his turnip seed into the ground early in June; and in October, by which time the turnips would have grown to a large size, he had the largest of them drawn without injuring the leaves, and then placed close to each other on the grass in the orchard, in the same position in which they grew. Their leaves preserved them from external injury; and their tap roots put out, in a short time, other fibrous roots into the grass; which, in orchards, is generally long in the autumn; and thus the turnips were preserved good for use. I inquired

I inquired whether the turnips acquired any additional size after their removal into the orchard, and whether, from the warmth occasioned by the turnips to the ground, any advantageous effect was apparent in the apple trees. On these questions he was not able to speak positively, though he thought the turnips had increased in size; and he thought, likewise, that the crops of apples appeared larger, and the annual bearings more certain in the orchard I was observing, than in those where no turnips were put; though, till the time I spoke, he had not even guessed at the cause.

I have the honour of being,
with due respect,
your obedient servant,
JAMES DEAN.

Exeter, April 28, 1805.

To C. TAYLOR, M. D.
Secretary, &c.

The SILVER MEDAL *of the Society was this Session voted to* Mr. ROBERT SALMON, *of Woburn, Bedfordshire, for his Remarks on* PRUNING FIR TREES.

The following Communications were received from him, and an ENGRAVING *is annexed, to explain the Advantages of the Method recommended.*

SIR,

I HAVE the honour of transmitting to you some observations on the management of fir plantations. Having had the care for some time past of such plantations, and knowing how much they are increased in this kingdom, I considered it as a matter of importance that a proper mode of management should be generally known, in order to bring timber to the greatest attainable perfection. For this reason I have turned my thoughts to the subject, and am confident

confident that much may be done, as is elsewhere asserted, by good management. I have collected several specimens to demonstrate the difference between good and bad management, and have made some observations which I have not before met with, and may perhaps be useful; you will have the goodness, therefore, to present these observations and specimens to the Society of Arts, and to believe me

Your very humble Servant,

Woburn, April 29, 1805. ROBERT SALMON.

To Dr. C. Taylor.

Reference to Plate II. showing specimens of English grown Fir Timber, cut out of his Grace the Duke of Bedford's plantations at Woburn, pointing out the impropriety of leaving timber to the course of nature, and the loss and defects that arise from such mode of management; also illustrating the necessity of some fundamental rule for managing the same, and the advantage of early and close pruning off superfluous branches, with a general rule for performing the same, and regulating the distance of the plants in Fir Plantations.

Fig. 1. Section A. shows a dead knot and progress in the growth of the tree, having 19 years of growth below the bough, and 18 years above it. From the regular course of nature, as shown by thissec tion, it is evident this bough or knot must have existed as long as the upper part of the tree, namely 18 years. For the first three years the growth and accumulation of the bough proceeded regularly with the tree; but about that time (now 15 years ago) the bough must have been distantly cut off, thereby preventing its regular increase in the part left remaining; for six years after cutting off, it appears to have barely existed, and after that ceased to exist at all but as a dead bough. Since it became so, nine years of accumulation has taken place on the

trunk of the tree, thereby gradually inclosing a part of the dead bough, which part so inclosed is what by joiners is properly called a dead knot; the boughs that exist and are inclosed whilst living, are the live knots, and these the tree will produce either as the bough may be distant or close cut from the tree. From this specimen may be determined, that if the bough had been cut close to the tree at four years growth, there would now have been sound clean wood over it to the outside: or when it was cut, if it had been taken off at ⊕, sound clean wood would have formed over it to the outside.

N. B. In all the specimens this mark ⊕ is affixed to point out the proper place for cutting off, and is so placed as to allow for thickness of bark at the time it should have been cut.

Section B. Shows a triking instance of the impropriety of leaving the smallest bough cut at a distance from the tree; this bough was cut off and became stagnant at two years growth, notwithstanding which it was 14 years before the wood on the trunk accumulated to the end of the dead knot.

Had this bough been cut at ⊕, the knot as far as that would have been firmly united with the tree, and above it all sound clean wood.

Fig. 2. Section C. Another instance of improper cutting.

If it had been cut at ⊕, the timber would have been more valuable.

Section D. This before cutting exhibited a healthy bough, and the section shows it the same, exhibiting a live knot. This specimen clearly shows the progress of nature in healthy boughs; it also shows the great impropriety of suffering such boughs to exist more than five or six years, at which age, had it been cut off, instead of a knot and great defect there would have been clean wood from ⊕ to the outside.

Fig. 3. Section E. Another striking proof of the impropriety of long cut boughs, a dead knot of many years standing, but

far

Mr. Salmon's Specimens of good & bad pruning of Fir Trees.

Fig: 1.

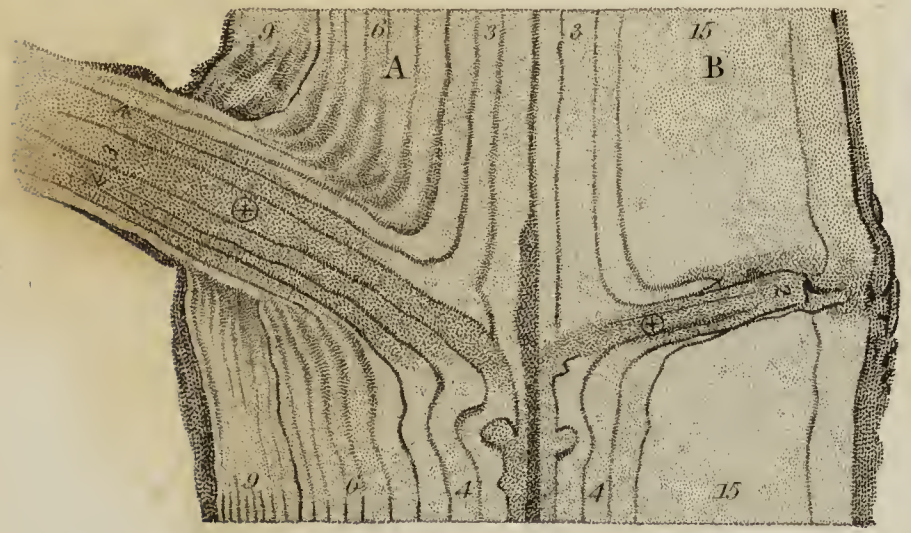


Fig: 2.

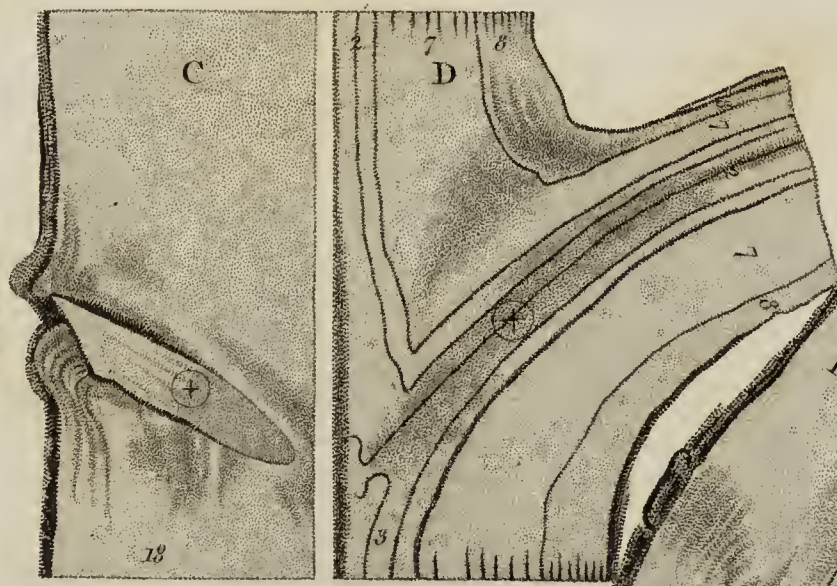


Fig: 3.

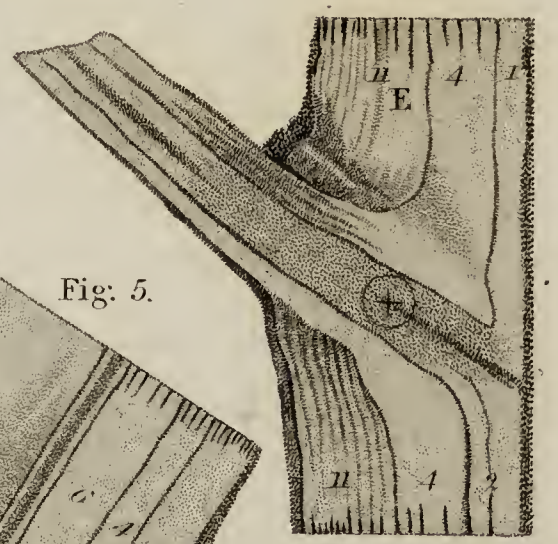


Fig: 4.

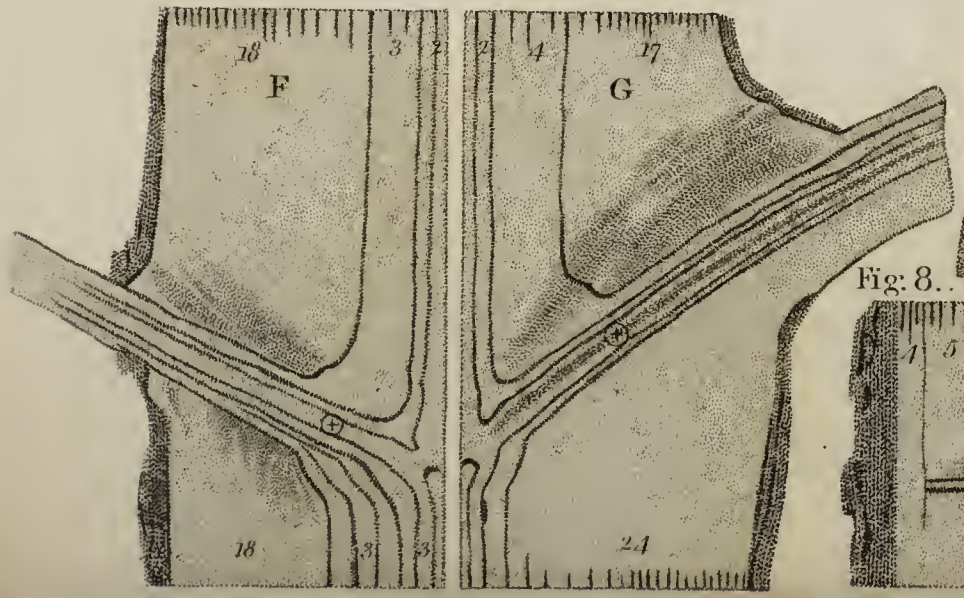


Fig: 5.

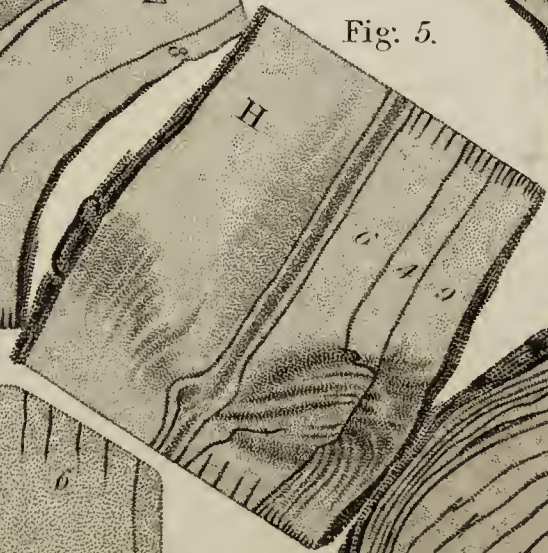


Fig: 6.

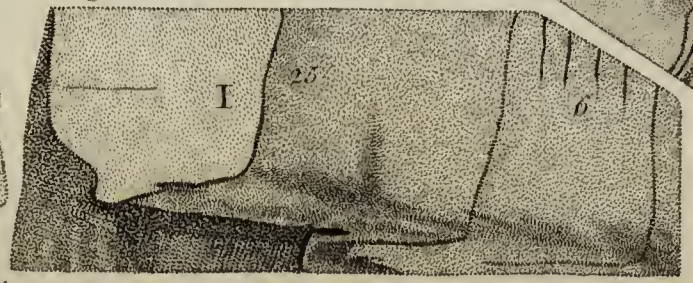


Fig: 7.

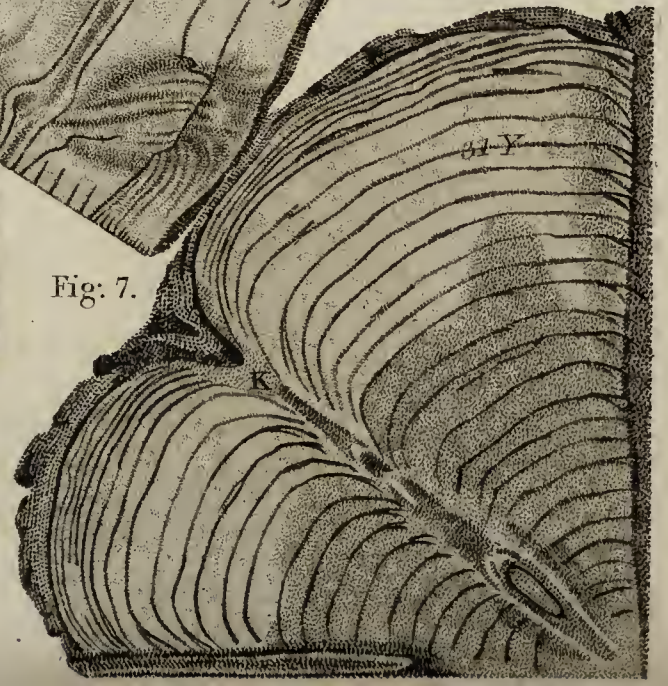
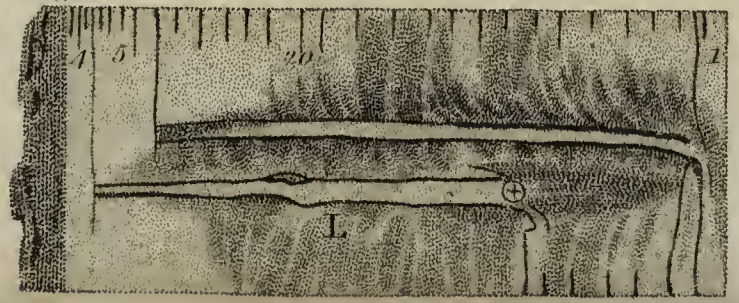


Fig: 8.



far from being inclosed now, admitting wet into the heart of the tree : its hould have been cut at ⊕ .

Fig. 4. Part of another Scotch fir.

Section F. A very striking proof of young and bad pruning. This bough was cut at four years growth, and now, after 18 years accumulation of the trunk, remaining uncovered, and would so have remained many years longer.

Section G. A bough which, whilst standing, appeared not vigorous or healthy ; the section shows that at six years it was in decline, and after that increased very little, though its increase may be distinctly traced to the present time.

This should years ago have been cut off.

Fig. 5. A very complete specimen of good pruning, though much too late.

Section H. A large bough cut off at six years growth, but so close cut, that in four years afterwards the wood on the trunk of the tree is arrived at the extremity of the knot.

Fig. 6 and 7. Parts of a Weymouth Pine Fir, 31 years growth, a most striking specimen, and complete refutation to the doctrine of those who contend that the best way is to leave plantations to prune themselves. This tree grew near the outside of a thick plantation securely fenced, and in a state of nature at the time it was felled, except some accidental breaking off a few boughs near the bottom of the tree. Before it was felled it indicated sickness by the foliage, but from what cause it was so, no trace appeared, as the trunk bore a very healthy appearance. The section shows, by the small increase of wood for the last six years, that it was not then healthy.

Section I. A dead knot from a bough broke off at six years growth ; since which 25 years growth of wood has formed on the trunk, without nearly covering the stump ; this stump was broke off before representation.

Fig. 7 is a horizontal section of three other knots cut from

the same round as fig. 6, showing the great obstruction to the growth of the tree round the knots: this also explains the cause of the great hollow round the knot in fig. 6.

The knot at K is a most striking and undeniable proof of the impropriety of leaving the smallest bough for nature's disposal. This bough protruded beyond the tree some distance, and evidently never existed but in a stagnate state, for the last twenty-nine years; it being only two years old when it so became stagnate.

Fig. 8. A piece of the same tree as fig. 6 and 7; but from the next higher tier of boughs, having a small piece wasted between the two.

Section L. Two small boughs, the upper one only one year's growth, was twenty years before covered, and has nine years wood over it. The lower bough is of six years growth, was twenty years before covered, and has four years wood over it.

On contemplating these specimens; considering the purposes that fir timber is generally applied to, and having some knowledge of plantations of this sort, it must occur that clearness of knots, straightness, length and equal size of its trunk, constitute its perfection; and, if deficient in all these, it is of no value but for the fire. Next to these considerations, and the prospect of an improved knowledge of cultivating this article, it may be a fair question, if our own country is not capable of producing fir timber little or not at all inferior to the foreign fir.

At present fir in this country appears not for any period to have been considered much otherways than as ornamental. For this purpose they serve but for a certain time, which past, it has been their fate to be cut down long before having attained maturity. But from the vast plantations now established, it is to be hoped that another century may obtain to English Fir some of the character of the English

English Oak; towards such end, if attainable, every means should be used, and towards which nothing appears more likely to succeed, than a well grounded general practical mode of management, from the time of their being planted out, to their greatest imaginable age of improvement. That a knowledge of such may by perseverance be gained, is not much to be doubted; and by inspecting and considering the specimens herein referred to, there appears great reason to conclude, that early and proper pruning and thinning will form a considerable feature in the system to be adopted.

Now as forms are first instruments in good systems, and that proceedings on fundamental principles (though in the essay they may a little err) are better, in a general view, than occasional success by hazard; so it may be warrantable that a system for general management may be laid down, although the author cannot possibly have lived to prove all by experience: so the rules hereafter submitted are given, being the result of only a few years observations.

For planting, from every authority or observation, there can be no doubt that all firs should be planted thick; not more than four or five feet apart.

Where firs of the same kind are planted together, there is less loss of plants from one sort overgrowing and destroying the others; consequently it appears advisable that all the different sorts be planted by themselves. If any admixture be at all admitted, the Scotch and larch may best succeed: but this is not certain, and they will certainly be best separate on two accounts; first, because they are not so likely to injure each other; and secondly, the larch may be put in the ground best suited to them, and the Scotch the same.

In making plantations of any particular sort, it may be

right to have a few spruce, or other sorts on the outside, to prevent mischief from sudden gusts of wind; but if the situation is not subject to such gusts, the spruce had better be omitted, being mechanical agents only, and by excluding the sun and air they act against the operation of nature.

In these hints ornament is not considered; if such be wanted, and profit also, then the spruce, larch, silver, and some other may be combined.

From some years observations on pruning and the effects thereof, it appears certain that Fir trees, at a certain age, should be pruned to a certain height; and for regulating thereof, the following simple rule is recommended. The pruning to commence when the trees are six years old, or when there is discernible five tier of boughs and the shoot; the three lower tier of boughs are then to be taken off. After this first pruning, the trees to be let alone for four or five years, and then, and at every succeeding four or five years, the pruning to be repeated, till the stem of the tree be clear to forty feet high, after which, as to pruning, it may be left to nature. The rule for the height of pruning, after the first time, to be half the extreme height of the tree, till they attain twenty years growth; and after that time, half the height of the tree, and as many feet more as it is inches in diameter at four feet from the ground. This pruning is known from repeated observations, not to be excessive, and the rule is calculated to check the too tapering top, and strengthen the slender bottom by carrying the pruning to a greater proportionate degree, in a ratio compounded of the height and bottom bulk; and by this rule it may be observed, that the trees will be at top cloathed with somewhat less than half their branches. The proper time for pruning, is between September and April, and the tool to be used, the saw.

Orderly thinning the trees at certain periods is the next essential

sential to pruning, and for this purpose observations have been made on the most orderly and thriving plantations, and the following simple rule is recommended. Keep the distance of the trees from each other equal to one-fifth of their height. In the application of this rule for thinning, it is evident that each individual tree can never be made to comply, for the original distance (even if planted in the most regular order) will allow only of certain modifications, by taking out every other tree, and so on; but even if the obtaining such equal distance was practicable, experience would show that another way should be preferred, of which the eye must be the judge, by taking out such trees as are least thriving, stand nearest another good tree, &c. &c.; at the same time keeping in view the rule prescribed: the following of which rules may easily be proved by measuring a chain square, or any quantity of the land, and counting the trees thereon; then by trying the height of two or three trees in that quarter, and taking one-fifth of such for the distance, it would be readily seen how many trees should be contained in the piece measured: or the practice may more simply be regulated, by taking the distance of eight or ten trees added together, the average of which should be equal to a fifth of the height of the trees.

In these rules nothing impracticable or complicate is proposed.

The author has for years known the expense, and produce from trimming only, and finds in Bedfordshire the produce doubly repays the expense; and although some experimentalists may differ from him, or time may show some reason for deviating somewhat from his rule, yet it is presumed all will agree that some simple system is advisable, instead of having plantations and woods mismanaged, to the great loss of the community and the proprietors. If such a system as proposed, be generally promulgated; if not perfect, it will most likely, in time, become so, and thereby have its ad-

vantage; and that some advantage may be had in speculation, the following concluding remarks are introduced.

In the common course of gardening, it is understood that pruning invigorates the tree; that trimming off the side branches makes the upright ones shoot the stronger, and by cutting out the dead and decayed wood the tree is kept alive: some of this doctrine will certainly apply to the tribe of firs; it will certainly substitute clean wood for knots, and of all this treatment, from their particular uses, they of all other trees stand in most need, and will be most improved by it. And should it be admitted that like treatment would on the fir, as well as other trees, produce the like effect, it would lead to a well-grounded expectation that, as well as producing clearness from knots, straightness and length, the same operation would advance the quality nearer to that of foreign fir; for it may be traced, that where trees are tall and clear of boughs or knots, the whole substance of the wood is better and of finer grain, and it appears likely that such will always be the case: the reason may probably be inferred from the sap having farther to rise and descend, and having no boughs to divert or delay it, the circulation must be more fine and rapid, most increase be left in the neighbourhood of the boughs at the top of the tree, and least on the sides at the lower part; consequently adding to the length of the head, and rendering more fine each annual increase to the body; thereby producing a close-grained, clean, long, and regular, easy-tapering useful piece of timber; instead of a coarse-grained, short, sudden-tapering trunk, with a quantity of boughs and knots.

The foregoing observations and rules are meant to apply to fir timber only, but to a certain degree they may be applied to other timber; though by no means to the same extent, or age. But if applied as far as the first fourteen years of their growth, and then the pruning altogether omitted, and the

the thinning-out very much increased, any plantation would be rendered much more valuable than if left entirely to nature.

ROBERT SALMON, Surveyor.

Woburn, April 2, 1806.

I hereby certify that in the year 1804, having directed Mr. ROBERT SALMON, to collect proofs as to the advantage of pruning and managing my fir plantations in this neighbourhood: accordingly, in January 1805, he produced several specimens, with his remarks thereon; both of which, I am of opinion, do convey a proof of the necessity and utility of attention and management in the growth of fir, and of timber in general; and such specimens, I think likely to be useful to the public, and worthy the attention of the Society for Encouragement of Arts, Manufactures and Commerce.

BEDFORD.

Woburn Abbey, March 22, 1806.

To Dr. C. TAYLOR.

CHEMISTRY.

CHEMISTRY.

TEN GUINEAS *were this Session voted to* MR. CHARLES WILSON, *No.* 6, *Worcester Street, near Union-Hall, Borough, for a Method of* CURING DAMP WALLS, *by the Application of a* COMPOSITION *of his Invention thereon.*

The following Communications were received from him, and Specimens of the Composition may be seen in the Society's Repository.

SIR,

I BEG leave to lay before the Society of Arts, &c. a cement, which, I trust, will be found of great utility in curing damp walls, in flooring damp kitchens, and for various other purposes, where the prevention of wet is necessary.

This cement when put in water will suffer neither an increase nor diminution in its weight: and it has the peculiar advantage of joining Portland-stone, or marble, so as to make them as durable as they were prior to the fracture.

I have the honour to be,
Your very humble servant,
CHARLES WILSON.

No. 6, *Worcester Street, Feb.* 4, 1805.

TO DR. C. TAYLOR.

Receipt for making the Cement.

Boil two quarts of tar with two ounces of kitchen grease, for a quarter of an hour, in an iron-pot. Add some

some of this tar to a mixture of slaked lime, and powdered glass, which have passed through a flour sieve, and been dried completely over the fire in an iron-pot; in the proportion of two parts of lime, and one of glass, till the mixture becomes of the consistence of thin plaster.

The cement must be used immediately after being mixed, and therefore it is proper not to mix more of it at a time than will coat one square foot of wall, since it quickly becomes too hard for use, and continues to increase its hardness for three weeks. Great care must also be taken to prevent any moisture from mixing with the cement.

For a wall which is merely damp, it will be sufficient to lay on one coating of the cement, about one-eighth of an inch thick; but should the wall be more than damp, or wet, it will be necessary to coat it a second time.

Plaster, made of lime, hair, and plaster of Paris, may be afterwards laid on the cement.

Mrs. Ann Kemmish, King Street, Borough; Mr. Boone, Gregory Place; and Mr. Thos. Cannadine, Hook's Gardens, Tooley Street, have certified that Mr. Wilson's cement has been used with effect, on damp walls belonging to them.

POLITE ARTS.

POLITE ARTS.

The SILVER MEDAL *and* TWENTY GUINEAS *were this Session voted to* MR. SEBASTIAN GRANDI, *No. 6, Brownlow-Street, Long-Acre, for* COLOURS *and* MATERIALS *for* PAINTING, *and for a* PREPARATION *of* GROUNDS *or* PANNELS *for* PAINTERS.

The following Communications were received from him; and Samples of the Colours, Materials and Pannels are placed in the Society's Repository.

SIR,

I HAVE had the honour of being employed by the most eminent professors of the fine arts, in Italy and England, and have assisted and improved the processes of preparing canvasses and pannels. By a number of experiments, I have, after much labour and expense, discovered, as far as experience can prove, the manner of preparing either canvass, copper, or pannel, in the old Venetian stile; an art which has been long lost, and to which it is well known that Titian, P. Veronese, Bassani, and other Venetian masters owed the peculiar harmony, brightness, and durability of their beautiful productions.

I have also a method of purifying oils for painters use, agreeably to the practice of the ancient masters; and I have prepared many mineral colours, which will never change, and may be used either in oil or water.

I have been enabled to produce crayons, of a quality

greatly superior to any in use, and which are fixed, so as to prevent their rubbing off the paper when used, and which may also be applied in water or oil.

The utility of the above preparations can be fully proved, by the united testimony of the members of the Royal Academy, by noblemen, and by artists in general.

The materials of which they are composed are extremely cheap, very easy to be procured, and none of the processes for preparation at all difficult.

I beg leave to communicate the above processes to the Society instituted for the Encouragement of Arts, &c.

I remain, Sir,

Your obedient servant,

SEBASTIAN GRANDI.

No. 6, Brownlow Street, Dec. 23, 1805.

To Dr. C. TAYLOR.

Mr. S. Grandi's Method of Preparing Pannels for Painters.

Take the bones of sheep's trotters, break them grossly, and boil them in water until cleared from their grease, then put them into a crucible, calcine them, and afterwards grind them to powder. Take some wheaten flour, put it in a pan over a slow fire until it is dry, then make it into a thin paste, add an equal quantity of the powdered bone-ash, and grind the whole mass well together: this mixture forms the ground for the pannel.

The pannel having been previously pumiced, some of the mixture above-mentioned is rubbed well thereon with a pumice-stone, to incorporate it with the pannel. Another coat of the composition is then applied with a brush upon the pannel, and suffered to dry, and the surface afterwards rubbed over with sand-paper.

A thin

A thin coat of the composition is then applied with a brush, and if a coloured ground is wanted, one or two coats of the colour is added, so as to complete the absorbent ground.

When it is necessary to paint upon a pannel thus prepared, it must be rubbed over with a coat of raw linseed or poppy-oil, as drying oil would destroy the absorbent quality of the ground; and the painter's colours should be mixed up with the purified oil hereafter mentioned.

Canvass grounds are prepared, by giving them a thin coat of the composition, afterwards drying and pumicing them, then giving them a second coat, and lastly a coat of colouring matter along with the composition.

The grounds thus prepared do not crack; they may be painted upon a very short time after being laid, and from their absorbent quality, allow the business to be proceeded upon with greater facility and better effect than with those prepared in the usual mode.

Method of Purifying Oil for Painting.

Make some of the bone-ashes into a paste with a little water, so as to form a mass or ball; put this ball into the fire, and make it red hot; then immerse it for an hour, in a quantity of raw linseed oil, sufficient to cover it: when cold, pour the oil into bottles, add to it a little bone-ash, let it stand to settle, and in a day it will be clear and fit for use.

White Colour

Is made by calcining the bone of sheep's trotters in a clear open fire, till they become a perfect white, which will never change.

Brown Colour

Is made from bones in a similar manner, only calcining them in a crucible instead of an open fire.

Yellow-Colour, or Masticot.

Take a piece of soft brick, of a yellowish colour, and burn it in the fire; then take for every pound of brick, a quarter of a pound of flake-white, grind them together and calcine them; afterwards wash the mixture, to separate the sand, and let the finer part gradually dry for use.

Red-Colour, equal to Indian-Red.

Take some of the pyrites, usually found in coal-pits, calcine them, and they will produce a beautiful red.

Grey Colour

Is made by calcining together blue-slate and bone-ashes powdered, grinding them together, afterwards washing them, and drying the mixture gradually.

Blue-Black

Is made by burning vine-stalks in a close crucible in a slow fire, till a perfect charcoal is made of them, which must be well ground for use.

Crayons

Are made of bone-ash powder mixed with spermaceti, adding thereto the colouring matters. The proper proportion is, three ounces of spermaceti to one pound of the powder. The spermaceti to be first dissolved in a pint of boiling water, then the white bone-ash added, and the whole to be well ground together, with as much of the colouring-matter as may be necessary for the shade of colour wanted. They are then to be rolled up in the proper form, and gradually dried upon a board.

White Chalk,

If required to work soft, is made by adding a quarter of a pound

a pound of whitening to one pound of the bone-ash powder; otherwise the bone-ash powder will answer alone. The coloured chalks are made by grinding the colouring-matter with bone-ashes.

Certificates from Sir WILLIAM BEECHY, Mr. BENJAMIN WEST, Mr. JOHN OPIE, Mr. MARTIN ARCHER SHEE, Mr. JAMES NORTHCOTE. Mr. THOMAS LAWRENCE, Mr. JOS. FARRINGTON, Mr. RICHARD COSWAY, Mr. P. J. DE LOUTHERBOURG, Mr. RICHARD M. PAYE, and Mr. ISAAC POCOCK confirm the good qualities of the Pannels prepared by Mr. GRANDI, and generally recommend Mr. Grandi's colours as useful and permanent.

PAPERS
IN
MANUFACTURES.

MANUFACTURES.

The GOLD MEDAL *of the Society was this Session voted to* MR. JOHN AUSTIN, *of Glasgow, for a* LOOM *to be* WORKED *by* STEAM *or* WATER.

The following Communication was received from him, and a complete Working-Model is preserved in the Society's Repository.

SIR,

AFTER much trouble, expense, and reiterated experiments, I have happily succeeded in completing a new WEAVING-LOOM, a Working-Model of which, with cloth in it, is presented to the Society for their inspection. It has, upon trial, succeeded beyond expectation, answers in every respect the purpose for which it is intended, and has met with the approbation of manufacturers of the first respectability in the country.

After many different attempts, I think that I have brought my weaving-loom, which may be driven by water, or steam, to such a state of perfection, as to prove its utility, the more it is known and employed.

My first attempt was made in the year 1789: I at that time entered a caveat for a patent, but relinquished the idea of obtaining one, and have since made many improvements upon my original plan. In 1796 a report in its favour

was

was made by the Chamber of Commerce and Manufactures at Glasgow; and in the year 1798, a loom was actually set at work, at Mr. J. Monteith's spinning-works, at Pollockshaws, four miles from Glasgow, which answered the purpose so well, that a building was erected by Mr. Monteith, for containing thirty looms, and afterwards another to hold about two-hundred.

The model now submitted for inspection, is an improvement upon those constructed for Mr. Monteith.

The following advantages which my Loom possesses, I beg leave to lay before the Society.

1. That from 300 to 400 of these looms may be worked by one water-wheel, or steam-engine, all of which will weave cloth, superior to what is done in the common way.

2. That they will go at the rate of sixty shoots in a minute, or two yards of a nine-hundred web in an hour.

3. That they will keep regular time in working, stop, and begin again, as quick as a stop watch.

4. They will keep constantly going, except at the time of shifting two shuttles, when the weft on the pirns is done.

5. In general, no knots need to be tied, and never more than one, in place of two, which are requisite, in the common way, when a thread breaks.

6. In case the shuttle stops in the shed, the lay will not come forward, and the loom will instantly stop working.

7. They will weave, proportionally slower, or quicker, according to the breadth and quality of the web, which may be the broadest now made.

8. They may be mounted with a harness, or spot heddles, to weave any pattern, twilled, striped, &c.

9. There

9. There is but one close shed, the same in both breadths, and the strain of the working has no effect on the yarn behind the rods.

10. The bore and temples always keep the same proper distance.

11. There is no time lost in looming, or cutting-out the cloth; but it is done while the loom is working, after the first time.

12. The weft is well stretched, and exactly even to the fabric required.

13. Every piece of cloth is measured to a straw's breadth, and marked where to be cut, at any given length.

14. The loom will work backwards, in case of any accident, or of one or more shoots missing.

15. Every thread is as regular on the yarn beam as in the cloth, having no more than two threads in the runner.

16. If a thread should appear too coarse or fine in the web, it can be changed, or any stripe altered at pleasure.

17. They will weave the finest yarn, more tenderly, and regularly, than any weaver can do with his hands and feet.

18. When a thread either of warp or weft breaks in it, the loom will instantly stop, without stopping any other loom, and will give warning by the ringing of a bell.

19. A loom of this kind occupies only the same space as a common loom; the expense of it will be about half more; but this additional expense is more than compensated by the various additional machinery, employed for preparing the yarn for the common loom, and which my loom renders entirely unnecessary.

20. The reeling, winding, warping, beaming, looming, combing, dressing, fanning, greasing, drawing bores, shifting heddles, rods and temples, which is nearly one-half of

the

the weaver's work, together with the general waste accompanying them, which is about six per cent. of the value of the yarn, and all which occur in the operations of the common loom, do not happen with my loom, which, by its single motion, without further trouble, performs every operation after the spinning, till the making of the cloth be accomplished; by which, independent of the saving of the waste, the expense incurred for reeling, warping, winding, &c. is saved, amounting to above twenty per cent. of the yarn.

21. The heddles, reed, and brushes, will wear longer than usual, from the regularity of their motion.

22. More than one-half of workmanship will be saved; one weaver and a boy being quite sufficient to manage five looms of coarse-work, and three or four in fine-work.

These advantages, which from experience my weaving-loom has been found to possess, and which upon inspection will be perceived, will, I presume, be esteemed of some magnitude.

My loom as now constructed and improved, is much simplified, so that the manual labour requisite is trifling; and if it is encouraged by the Society of Arts, I am sensible much advantage will arise from their approbation, and the publicity it will in consequence receive.

I am, Sir,

Your humble servant,

JOHN AUSTIN.

London, Feb. 19, 1806.

To Dr. C. TAYLOR.

Certificates were produced from Messrs. HUGH CROSS, MATTHEW PERSTEN, and DAVID MUTRIE, dated Glasgow, October 12, 1796, stating that, by appointment

pointment of the Chamber of Commerce in Glasgow, they had inspected the Loom constructed by Mr. Austin, and were of opinion, that it will be found to contain some ingenious and useful improvements, by producing saving and facility in several of the ordinary operations.

Messrs. NEIL, MACVICAR, and THOS. HENDERSON, of Edinburgh, certified on the 12th of April, 1804, that they had seen, in the Trustee's office there, the model of Mr. Austin's Loom, and that they thought it ingenious, and the best they had then seen.

Further Certificates from Edinburgh, dated April 14, 1804, from Mr. JOHN DRUMMOND, and from Messrs. JAMES REID and JOHN WAUGH, partners in the house of WALTER BIGGER and Co. linen-manufacturers, testify to the ingenuity of Mr. Austin's Loom, and that it is capable of being employed to the great advantage of the manufactures of this country.

Mr. AUSTIN having left a complete Working-Model of his Loom with the Society of Arts, &c. a reference to it will convey an idea of its principles, better than any description that might be attempted; as from the variety of minute parts in it, the Committee of the Society have thought it impossible to have a drawing of it, upon their usual scale, which can be rendered sufficiently intelligible.

TWENTY GUINEAS *were this Session voted to* Mr. J. ROBERTSON *of St. Mary's Wind, Edinburgh, for a* LOOM *for* WEAVING FISHING-NETS.

The following Communication was received from him, and an Engraving is annexed. A Model of the Loom is placed in the Society's Repository.

SIR,

A MACHINE for weaving nets has long been a desideratum in the arts. Fishermen experience many difficulties from their nets being frequently broken by dog-fish, and other marine animals, and the consequent length of time, required by the present mode of netting, in repairing their injured nets, or in making others. A fisherman is sometimes compelled, from such accidents, to relinquish fishing for a whole season. Any method, therefore, which leads to accelerate the fabrication of nets, without increasing the expense of them, must be beneficial to the community.

From this consideration, I have paid great attention to the subject, and now submit to the Society a model which, it is presumed, will answer the purpose held in view, of expediting net-work, while, so far from increasing the expense of them, it will diminish it.

I have, indeed, to regret, that from my obligation to provide, by my own manual labour, for a numerous family, I have been unable to establish the utility of the invention, by the experience of an extensive scale. I am, nevertheless, convinced, that the invention is better adapted for the object in question, than any which has hitherto been proposed. As such, I humbly lay it before the Society of Arts, &c. and am,

Sir,

Your obedient servant,

JOHN ROBERTSON.

Edinburgh, June 12, 1804.

To Dr. C. TAYLOR.

Reference

Mr. Robertson's Loom for making Fishing Nets.

Fig. 5.

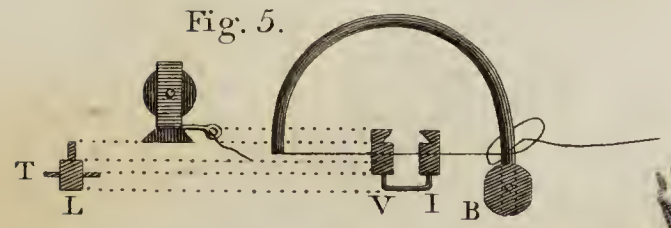


Fig. 1.

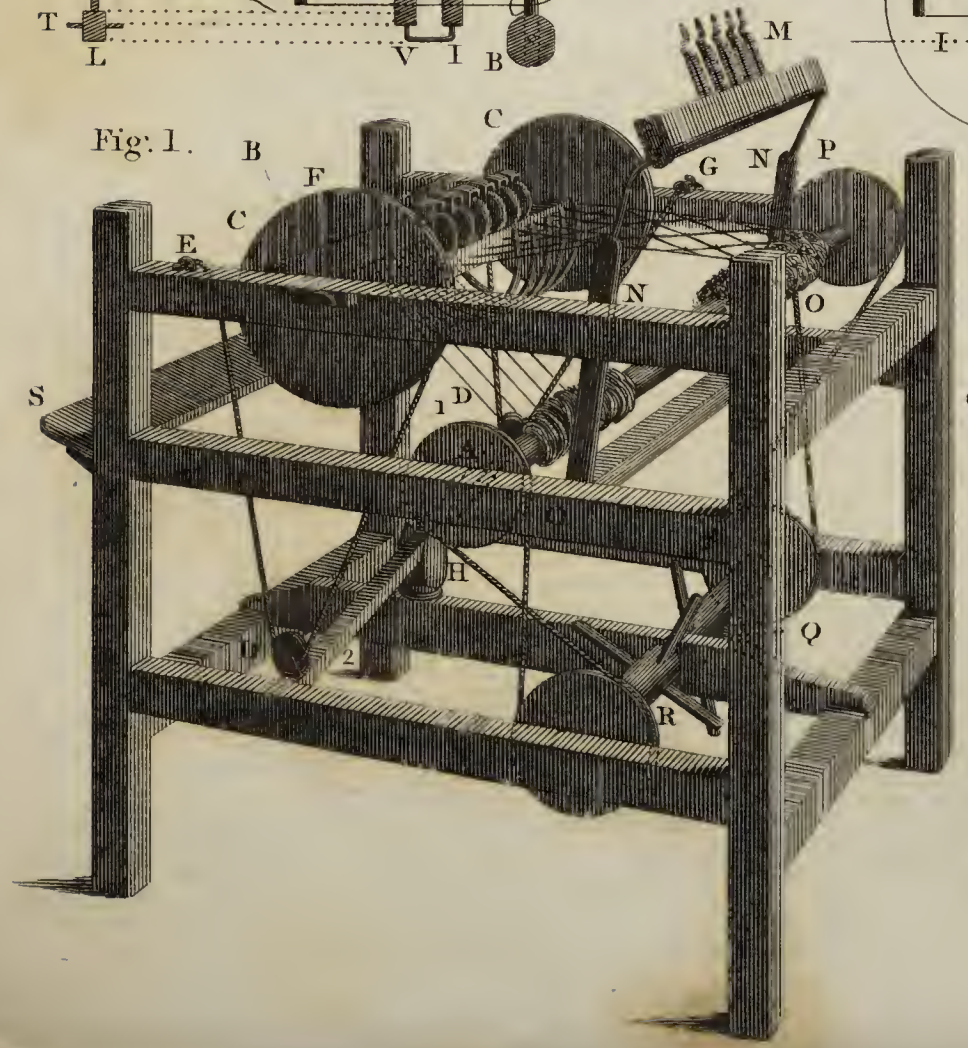


Fig. 3.

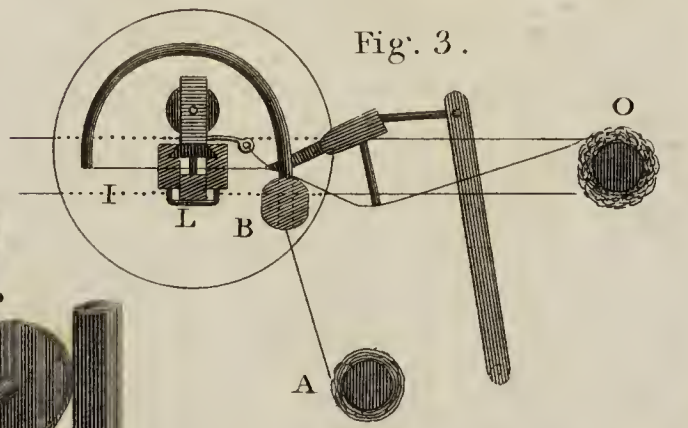


Fig. 7.

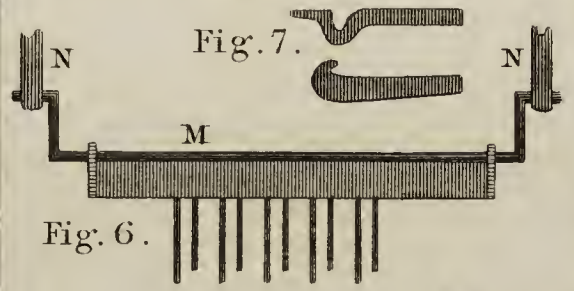


Fig. 6.

Fig. 2.

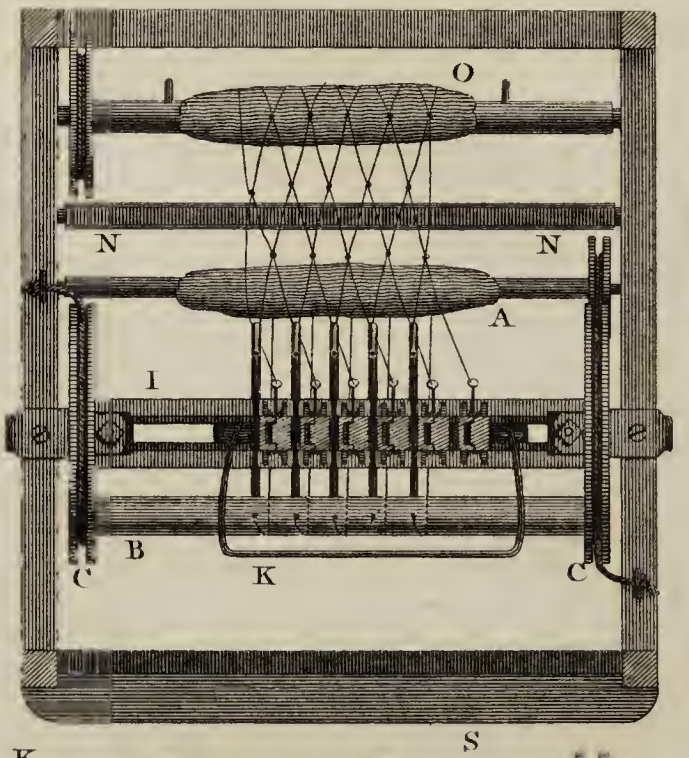


Fig. 4.

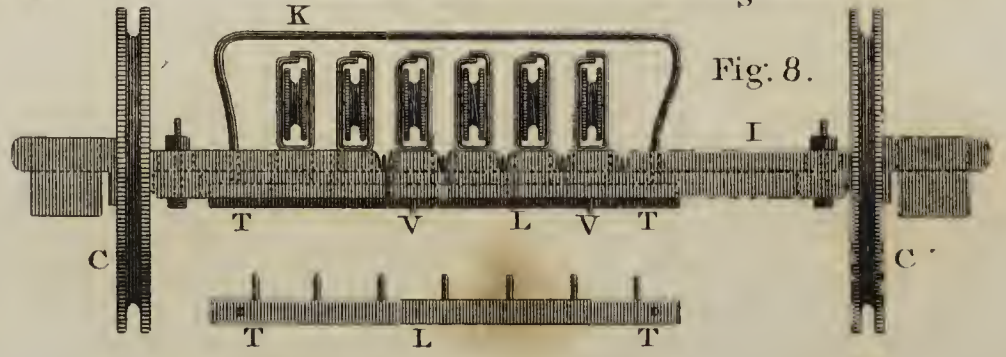


Fig. 8.

Fig. 9.

Reference to the Engraving of Mr. Robertson's Loom for Weaving Fishing-Nets. Plate III. Fig. 1 *to* 9.

Fig. 1. Is the machine in a state ready to begin working, supported in a wooden frame. A is a beam, on which the twines for the net is rolled, in number equal to the knots tied, and from which it passes through circular tubes fixed in a bar, B (shown by dotted lines through the pulley, but seen better Fig. 2) which is fixed near the circumference of two equal pullies C, C, that turn on their axis by means of a cross-treadle, with small pullies at each end, D, D, through which passes a band, one end of which is fastened on the frame at E, and the other on the pully C. At F, the band through the other pulley has one end fastened on the frame at G, and being wound round the farthest pulley C, is fastened on the under side of it, which by the alternate action of the traddle on its axis H, moves the pullies C, C, and circular tubes from their situation in Fig. 1, to that in Fig. 3, and back again. In the centre of the pullies C, C, is fixed another bar P with a dove-tail groove, where the pirns that contain the twine are supported, (it being necessary to have two threads for every mesh, also one pirn more than there are tubes). In a groove under the dovetail is a slider L, moved by a wire K, fixed in each end of it, having pins in it, by which it moves the pirns backwards or forwards over the notches in the bar I, so as to cast a part of the knot: the pulliesC, C, and bar B move round the bar I as an axis, but independant of it, the bar I being fastened through the pullies to the frame. M is a moveable bar (centred within two supporters N, N, haying two joints) with hooks; both for catching the twine at the end of the circular tubes, and by crossing the hooks to the other side of the points of the tubes, will give the twine a turn for forming the knot, and by raising the points of the

hooks

hooks the ends of the tubes enter between them, as shown Fig. 4 : and by the circular motion of the bar B, when the two pullies C, C, are turning on its centre by the foot, on the end, No. 1, of the cross-traddle, and until the knots so formed are close to bar B, Fig. 3, (it is then what we call a running knot) a part of which falls into a noteh cut below the level of the supporters of the pirns in the bar I, then slide the pirns over the notches that contain the twine, the knot is then cast, and then by the foot on the other end, No. 2, of the cross-traddle, until the points of the tubes are returned to its former position, then remove the knot by disengaging the hooks and the tubes, then the knots are made tight as the wrought-part of the net is rolled on beam, O, on one end of which there is a pulley, P, with a band that communicates with the pulley, on the end of a short roller, Q, in which are fixed four cross bits of wood that answer the purpose of treadles for the feet, by which it is drawn tight. R is another short roller communicating with the roller A, serving to give out the proper quantity of twine for the length of the meshes, or to hold it while the other roller tightens the knot. S is the seat.

Fig. 2. Is a plan of the machine, the moveable bar and treadles left out to prevent confusion.

Fig. 3. Is the situation of the running knot when the pirn goes through it.

Fig. 5. Is the tube in the same position, showing the manner the knot is twisted round it; and having the pirn and slider L taken out of the bar I, the dotted lines showing at what height they come together. In the slider L there are two pins, T T, to prevent its rising high enough to touch the string; and in the bar I there are two wires O O, like staples, to support the slider L in its place.

Fig. 6.

Fig. 6. Is the moveable bar M with the hooks.

Fig. 7. Is the hooks t large.

Fig. 8. Is the bar I, showing the notches in which the strings lay, to let the pirns pass over them, (when the tubes are brought over as in Fig. 3).

Fig. 9. Is the slider L, with the pins that move the pirns.

SIR,

MR. JOHN ROBERTSON, stocking weaver here, having lately communicated to the Highland Society of Scotland your letter to him of the 6th April, 1805, together with a model of his machine for weaving fishing nets, I have been desired by the directors to recommend him to the notice of the Society of Arts, &c. and to mention that if his invention can be made practically useful, it will most materially contribute to the extension of the fisheries, by cheapening the expence of outfit.

Although improvements in the mechanic arts do not fall within the plan of their Institution, yet the Highland Society have given Mr. Robertson a few guineas, to enable him to attend personally on the Society of Arts, &c. and to explain his machine.

I am, Sir,
Your most obedient Servant,
D. MACLACHLAN, Secretary.

Highland Society Hall, Edinburgh,
March 26, 1806.

To C. TAYLOR, M. D.

From Mr. Robertson's subsequent statement to the Committee of the Society of Arts, &c. it appears that the nets used in the northern fisheries are of one breadth throughout. He supposes he could make three courses of one

hundred meshes each in one minute; that such a loom should be about 3½ feet wide, and would cost about fifteen or sixteen pounds.

A Certificate from Sir John Sinclair stated that Mr. Robertson's invention was much approved of in Scotland, and that he trusted it would be found entitled to the patronage of the Society of Arts, &c.

FIFTEEN GUINEAS *were this Session voted to* Mr. WILLIAM NEVEN, *Barrack Court, Woolwich, for* WEAVING CLOTH *of extremely fine quality.*

The following Communications were received from him, and Samples of the Cloth are preserved in the Society's Repository.

SIR,

PERMIT me to inform you that I have discovered an improvement in the art of weaving, which certainly will turn out a great national advantage.

By this improvement cotton, linen, and silk goods, can be made much sooner and finer, than by any method yet discovered. Upon this principle I have made a small piece of plain silk cloth, from hard thrown silk in the gum, that contains the amazing quantity of 65,536 meshes in one square inch, a number infinitely more than in any other cloth ever before made.

It is impossible for any reed-maker to make a reed half so fine as to weave such cloth upon the present principles of weaving; and even if that could be done, no weaver could make use of it: but by my method, I weave as fine cloth in a twelve hundred reed as by the present method in one

of

of twenty-four hundred, and with rather less than more trouble.

I have sent specimens of both silk and cotton cloth, woven upon this principle, and material advantage may be derived from this plan in making cambrics, muslins, &c.

There are two specimens of cotton cloth sent: the coarse or barred kind is the cloth as it comes from the loom, and is converted into the finer specimen before it goes to the bleach field.

In the silk cloth you will see the state in which it comes from the loom, and my improvement thereof, all in the same piece; a circumstance which must be convincing. Respecting the method of doing it, I can instruct any person whatever in two minutes.

I hope the Society will find this improvement deserving of a premium, &c.

And I remain, Sir,
Your obedient Servant,
WILLIAM NEVEN.

No. 19, *Barrack Court, Woolwich,*
April 15, 1806.

To C. Taylor, M. D.

Mr. Neven explained to a Committee of the Society, that his improved mode consists upon adding more thread of the warp within each dent or split of the reed than in the common way; for instance, that where in the common mode there are only two threads in the reed, there are upon his plan three or four.

The weft or shoot is thrown in the common way with a single thread.

When the cloth is woven and taken out of the loom, it has the appearance of being barred or striped, the cane of the reed occasioning that part of the cloth struck with it to look thinner, owing to the threads of the warp being further apart.

The cloth is then to be wet in water, and in that state to be repeatedly stretched across by the hands backwards and forwards corner ways; by this means the threads, which apparently formed the stripe, or close part of the cloth, separate from each other, and become diffused at equal distances. The appearance of stripes being entirely removed, the cloth becomes of inconceivable fineness, and extremely regular in texture. This operation must in cotton fabrics be performed before the cloth goes to the bleach-ground.

Silk goods, on being taken out of the loom, must be wet and well rubbed, as in the common mode of washing, and then stretched backwards and forwards, as in the manner above directed for cotton goods.

In silk goods the warp and weft may be both alike; in cotton goods the weft may be softer, but of the same fineness.

Mr. Neven stated, that fine linen cambrics may be made on this plan, much superior to any hitherto made in France.

That though there are three threads within each dent, or split of the reed, whilst the cloth is weaving, yet the headles or yealds lift up the threads alternately throughout the whole breadth of the cloth, and that there are about 250 shoots in an inch.

PAPERS

IN

MECHANICS.

MECHANICS.

The GOLD MEDAL, *or* THIRTY GUINEAS, *at the Option of the Candidate, were this Session adjudged to* Dr. THOMAS COGAN *of Bath, for his Invention of a* DRAG, *for raising the Bodies of Persons who have sunk under Water.—Class* 140.

Dr. COGAN *preferred the honorary Reward.*

The following Communication was received from him. An ENGRAVING *is annexed, and the two* DRAGS *described are preserved in the Society's Repository.*

SIR,

FROM the Reports of the Royal Humane Society for the year 1805, I learn, that a premium is offered by the Society instituted in London, for the Encouragement of Arts, Manufactures, &c. "To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up in the best and most expeditious manner, and with the least injury to, the bodies of persons who shall have sunk under water:" and accordingly I beg leave to submit to the inspection of the Society two models.

I have long, Sir, been discontented with the construction of the drags which have hitherto been in use, both in this and in other countries. Those used in Holland are not more than three or four inches in diameter, with very long and sharp points. They cannot therefore be properly applied to a naked body; and were not the Dutch sailors and boatmen, who are most exposed to danger, very thickly clad, they might be productive of mischief. I attempted,

when resident in that country, to make some improvements, by turning the points obliquely inwards, so as to catch the clothes without penetrating deep into the body; but still these were only applicable in cases where the subject fell into the water in his clothes. The drag which is now used in London is, in many respects, exceptionable; it is clumsy and dangerous.

The design of establishing a Humane Society at Bath, induced me to reconsider the subject with more attention; and the result has been the construction of two drags, according to the models which are sent to you, at the desire of that Society. The consideration of economy has induced me to construct the drag, Fig. 2. as it may be made at about half the price of the other, and in some cases be equally useful. The drag, Fig. 1. is applicable to every case, and the only objection to it is its higher price.

You will perceive by the annexed drawing the object in view, which is to multiply the chances of laying secure hold of any part of the body, without the possibility of an injury. Had the dimensions been smaller than they are, the drag would not encompass every part of a human body; and without the partition and curvatures at the extremities, the distances would be too great, and the body of a child might fall through the intermediate spaces. By means of the sliding hooks at the ends, the instrument is adapted both to naked bodies, and those which are clothed. As bathers are naked, the sharp-pointed extremities might lacerate in a disagreeable though not a dangerous manner: or by entering the skin, they might impede a firmer hold. They are therefore made to recede.

But in accidents from skaiting, or in such where the subject falls into the water with his clothes on, the hooks will be of the utmost advantage, as the slightest hold will be sufficient to render the body buoyant.

The upper extremities are made both with a socket and a loop,

a loop, by which they are accommodated either to a pole or a cord; or, which is still better, to both. In ponds or rivers, where accidents are most likely to happen, should they occur at a distance from the shore, no pole would be able to reach to a sufficient extent, unless the assistants were in a boat, which is not at all times at hand. In such cases a cord may be attached to the loop, and the instrument be thrown to the place where the body is supposed to lie. If the person exposed to danger should be able to swim a little, or in any way just support himself from sinking, he might possibly lay hold of the floating piece of wood connected with the lower end of the drag by means of a rope, and thus be brought to shore. This appendage answers another purpose. In rivers particularly, the limbs of the instrument may probably catch roots of trees, &c. and can only be disengaged by pulling the drag in a contrary direction by means of the floating wood and rope.

When I said that both pole and cord are preferable to either singly, it was for the following reason. I have found by experiments, that a cord tied to the ring or loop, and passing through a hole made at the upper end of the pole, gives a double advantage. The drag, with a pole attached to it, of not more than 10 or 12 feet in length, may be projected several yards further than without it; and in drawing forward the drag, till the end of the pole is brought within reach of the hand, the subject may be raised above the surface of the water in the most proper direction. But a pole of 15 or 16 feet in length is unwieldy, and would even float the drag unless it was made much heavier.

If a drag was wanted in those cases only, where it is not necessary to throw it to a distance, then Fig. 2. would answer every purpose. It is obvious that this requires a pole to be fixed in it, so that the hand may direct the projecting parts to the body, which otherwise could not always be done.

We

We have not as yet had an opportunity of trying these drags upon a human body; but upon an effigy made in every respect as like as possible in form to the human body, both clothed and unclothed, they have answered in the most satisfactory manner. The effigy was brought to the surface in various directions, without once slipping from the hold.

I shall just beg leave to add, that with two drags and a boat, assistance given in time would almost ensure success. A hook catching a single thread, it is well known, will be sufficient to bring a human body to the surface of the water, or till it becomes visible: a second drag at such time might be applied to any part of the body, so as to secure a firm hold.

The workman charges the triangular drag at one guinea, the other at 12 shillings. A pole 16 feet in length was charged three shillings. The fangs were estimated at one shilling and sixpence.

I am, Sir,
Your most humble Servant,
THOMAS COGAN.

Bath, March 1, 1806.
To C. TAYLOR, M. D.

Reference to the Engraving of Dr. Cogan's Drag. Plate IV, Fig. 1, 2, 3, and 4.

Fig. 1. A shews the drag complete, with two cords B and C attached to it; that at the top, B, is fastened to a ring at D; the bottom cord is tied to a hole in the iron at E. The six ends of the projecting branches have each a barbed claw, which can be slided forward or drawn back, as may be thought necessary. There is a hollow socket in the upper part of the drag at D, so as to admit the end of a pole to be screwed therein, whenever it may be thought useful.

Fig. 2.

Mr. A. Slafs's Machine for Shoemakers.

Fig. 5.

Fig. 6.

Fig. 2.

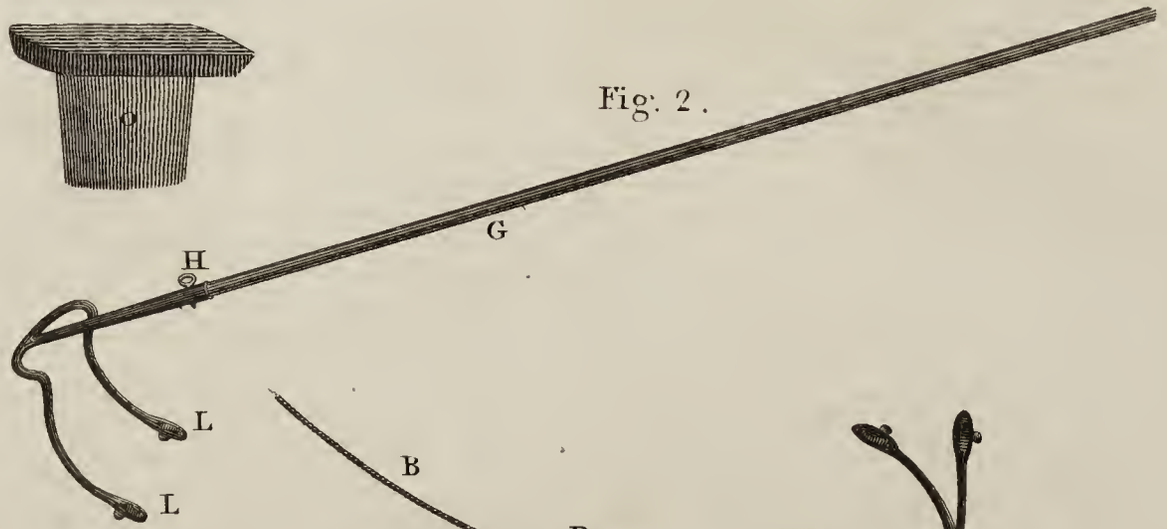


Fig. 4.

Fig. 3.

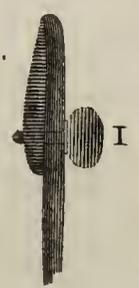
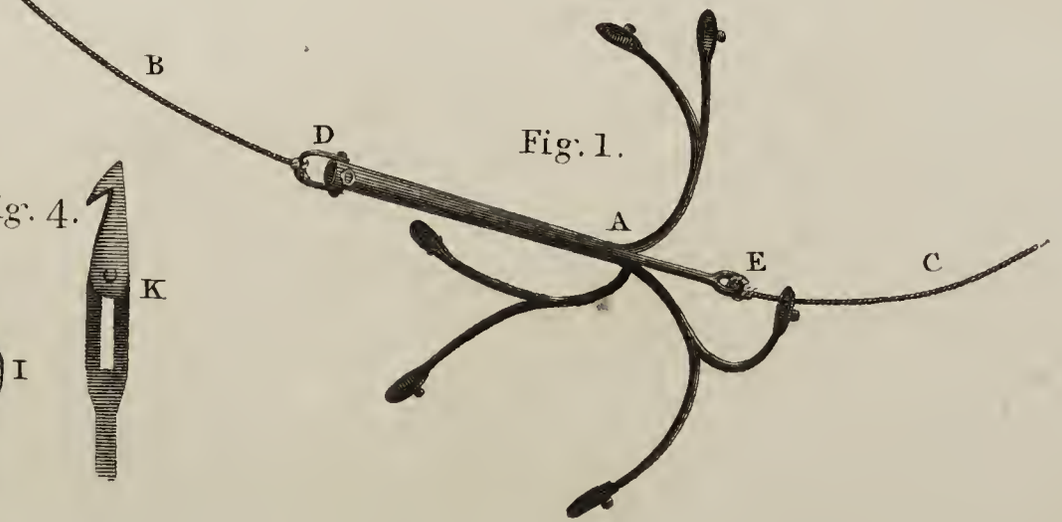


Fig. 1.



Dr. Cogan's Drags.

Fig. 2. Is the cheaper or more simple drag, and intended only to be used with a pole G, fastened in its hollow socket by the screw H, and to be used in the manner of a rake to bring the body to land. It has barbed claws at the extremities of its branches L L, moveable backwards and forwards, which claws slide in a groove made in the extremity of each branch.

Fig. 3. Shows one of the claws drawn upon a larger scale, screwed to one of the extremities of a branch. In this situation the screw head appears at I, on the outside of the branch, and the claw is within, and does not extend beyond the extremity of the branch.

Fig. 4. Shows the same barbed claw at its utmost extent, projecting beyond the extremity of the branch. The end of the worm of the screw, which holds it fast in that position, appears at K.

TEN GUINEAS *were this Session voted to* Mr. A. STASS, *No.* 18, *Porter Street, Newport Market, for a* MACHINE, *to enable Shoemakers to make* SHOES *or* BOOTS *without suffering that pressure upon the Stomach usual in that Trade.*

The following Communication was received from him; an ENGRAVING *is annexed, and one of the Machines is placed in the Society's Repository.*

SIR,

I BEG leave to offer for the consideration of the Society, a machine, by which the vocation of a numerous and hard-working class of men may be rendered less deleterious to their health, than it has been ever since they were considered a trade.

This machine is to be used by men when making shoes

or

or closing boots, and is constructed to save them the disagreeable and hurtful posture they now use, by sitting in a cramped and painful situation; and it has been vouched for by physicians of the first abilities, that most of that particular class of labouring men die of asthma and consumption, occasioned by constant application in so unwholesome a posture.

This machine, simple in itself, is so constructed, that a man may stand to his work, sit, or recline in a half sitting posture, and without having constantly his work pressing against his breast or stomach. It is not awkward; but from the inspection of some of the first workmen in the trade, has been highly approved of in every respect, being not only useful, but of great comfort and convenience when compared with the method of working heretofore adopted.

I beg therefore to request the Society will allow me to submit it to their inspection, as I am anxious that my good intentions to my fellow-workmen may be generally known and adopted, and I know no better method than by receiving the approbation of so Honourable a Society.

I shall feel myself truly gratified if I may be so far honoured with their attention; and I beg to know when you will be pleased that I shall attend the committee, to explain its mechanism, and on that occasion I will work a boot or shoe on it in their presence.

I have the honour to be, Sir,
Your most obedient humble Servant,

A. STASS.

Porter Street, Newport Market,
May 16, 1805.

To C. TAYLOR, M. D.

Reference

Reference to Mr. Stass's Machine for Shoemakers.
Plate IV. Fig. 5, 6.

Fig. 5. *a.* The bench standing on four legs about four feet from the ground.

b, A circular cushion affixed to the bench, in the centre of which cushion is a hole quite through the bench, through which a leather strap *c* is brought up from below. This strap holds the work and last firm upon the cushion, in any position required, by means of the workman's foot placed upon the treadle *d.*

e, Shows the last upon the cushion, with the strap holding it firm.

f, Is a seat for the workman to use occasionally; it is supported behind by two legs, and in the front by a cross piece of wood, into which a projecting arm extends from the seat, and allows the seat to be moved nearer or further from the work as may be required.

g, A shelf, on which the hammer may be laid.

h, A leather bag to contain the tools.

i, A drawer, to hold such articles as should be kept free from dust.

k, Leather slips to contain the cutting knives.

l, A whetstone, on which the knives are to be sharpened, and moveable on an upright pivot or axis *m.*

n, The upper part of the bench to hold the lap-stone, &c.

Fig. 6. The lap-stone. The conical part *o,* fits into the hole in the cushion *b,* so as to hold it firm, whilst the leather is beaten with a hammer.

The GOLD MEDAL *this Session was voted to* JOHN TROTTER, *Esq. of Soho Square, for his Invention of a* CURVILINEAR SAW.

The following Communication was received from him; and a Model of the Saw is preserved in the Society's Repository.

GENTLEMEN,

WITH the view of obviating many difficulties and expenses, which have long attended the operations of those requiring curvilinear sawing in their trade, and of public bodies connected with those trades, through the licentious and refractory conduct of sawyers, it has been represented to me as a measure extremely desirable, to adopt more generally mechanical powers, could such be discovered as would preclude much mystery and manual labour.

Considering the subject in a national point of view, as connected with our naval yards in the formation of timber; with our military departments, in respect to wheels of every description; with our whale and herring fisheries; our public and private breweries and distilleries; our East and West India Companies, and other bodies depending on cooperages, as well as other minor trades peculiarly liable to the evils complained of, I invented a curvilinear saw, which, with little aid of the most ignorant labourer, answers every purpose.

Having effected these ends, suffer me to solicit the honour of your acceptance of a model, together with a drawing of my saw, sufficiently accurate for the use of those in remote situations

situations to work by, who may wish to use or make them.

I have the honour to be,
Gentlemen,
Your most obedient and most humble Servant,
JOHN TROTTER.

Soho Square, Sept. 12, 1805.

To the Society for the Encouragement
of Arts, &c.

Reference to the Engraving of Mr. Trotter's Curvilinear Saw. Plate V.

Fig. 1. Represents a bird's eye view of the saw and machinery. The dotted lines show the spindle *a*, moving on two centers *b*, *b*, having at one end a pulley *c*, and at the other a concave saw *d* (with a corresponding convexity to the curve required to be sawed,) secured on the convex side by a collar, and on the concave side by a loose collar, and screw nut.

e, *e*, Two grooved plates, admitting through the top of the bench and fence *f*, screw bolts fastened by thumb nuts, by means of which, and a parallel motion *g* the fence *f* is regulated, and consequently the conductor *h* of the wood *i*, admits it to be sawed through, as represented in the dotted line at any part required.

The fence, conductor, and saw, must all be curved alike; but to saw in smaller circles, with the same saw and at the same time square with the face of the bench, a steel slider *k*, regulated by two screws, is made to press, as occasion may require, on the convex side of the saw, and raise the vertical line of it to a right angle with the bench; otherwise

wise the top of the bench itself must receive the same inclination to the vertical line of the fixed saw.

Fig. 2. Is a front view of the saw and bench, in which the teeth of the saw are more clearly shown.

Fig 3. An end view of the same machinery.

Fig. 4. Shows the saw, axle, and pulley, all made of iron or steel, and separated from the frame.

FIFTEEN GUINEAS *were this Session voted to* Mr. JAMES HARDIE, *of Glasgow, for a* BOOKBINDER'S CUTTING PRESS.

An ENGRAVING *of the Machine is annexed, and a Machine is reserved in the Society's Repository.*

SIR,

I HAVE herewith sent a model of an improved press for bookbinders, the invention of Mr. James Hardie, bookbinder, Glasgow. The inventor claims no other merit than that of having simplified the coon press, rendered it more powerful, and adapted it to work more economically; or, in other words, to save time to the workman. It has been found so superior to the press in common use, that all the bookbinders in Glasgow and Edinburgh are adopting it. This is perhaps the best proof that can be given of its utility. The inventor has received certificates from the bookbinders alluded to, which will be sent to the Society. if they think the press worthy of their notice. Mr. Hardie, in desiring me to submit the model to the inspection of the Society, has in view chiefly to benefit the bookbinders in places remote from his residence, an object which he thinks cannot be so well attained in

any

Mr. I. Trotter's Curvelinear Saw.

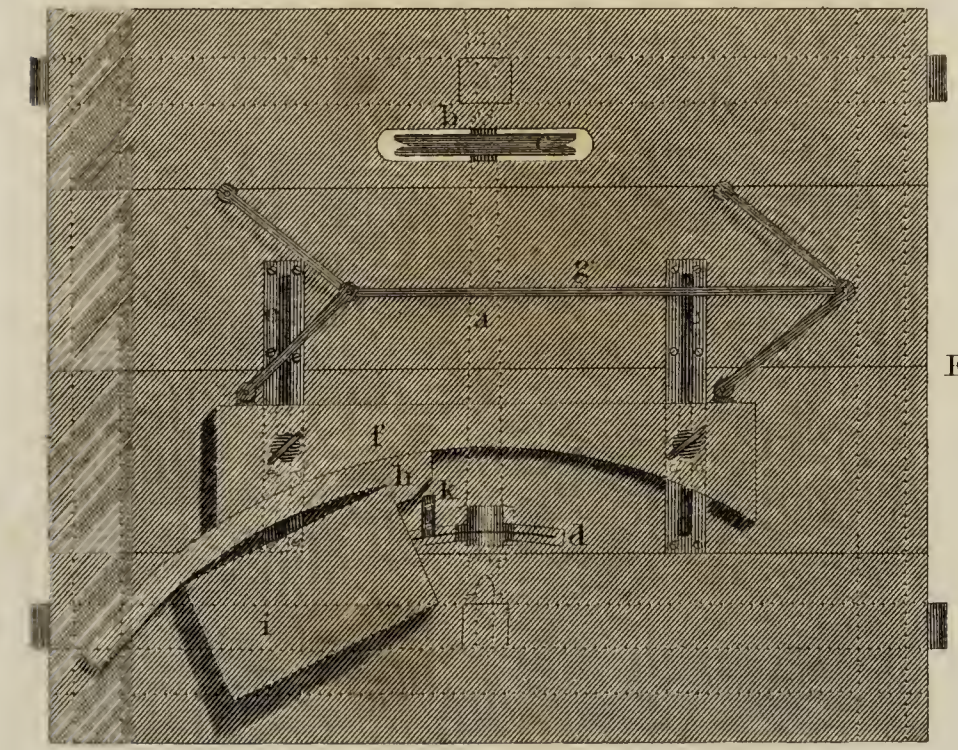
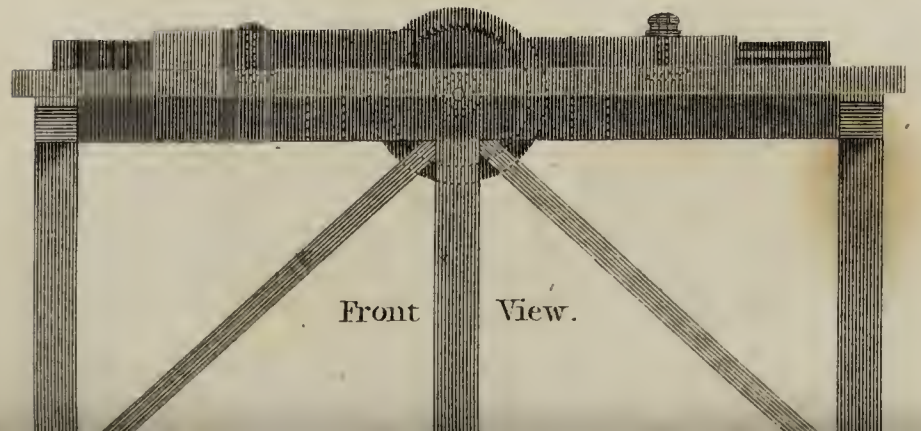


Fig: 1.

Fig: 2.



Mr. I. Hardie's Book Binders Cutting Press.

Fig: 5.

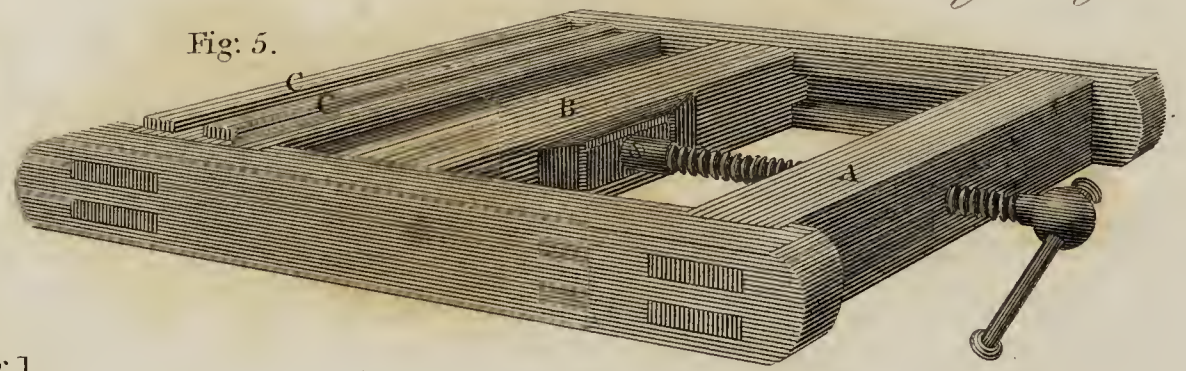
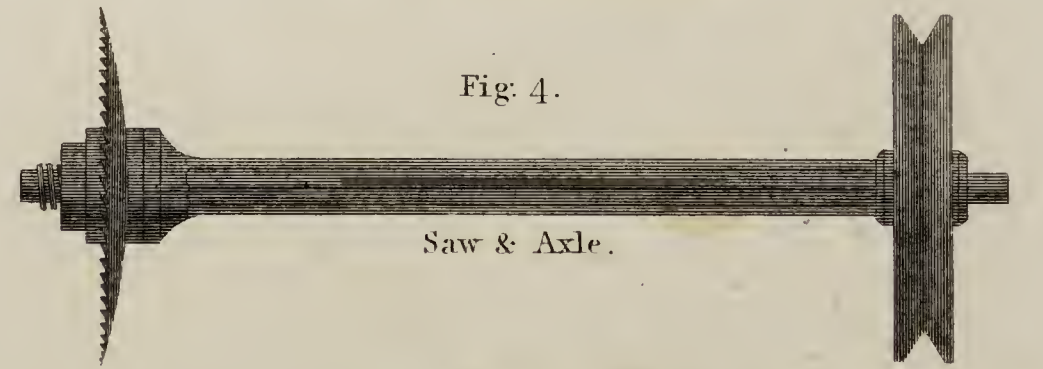
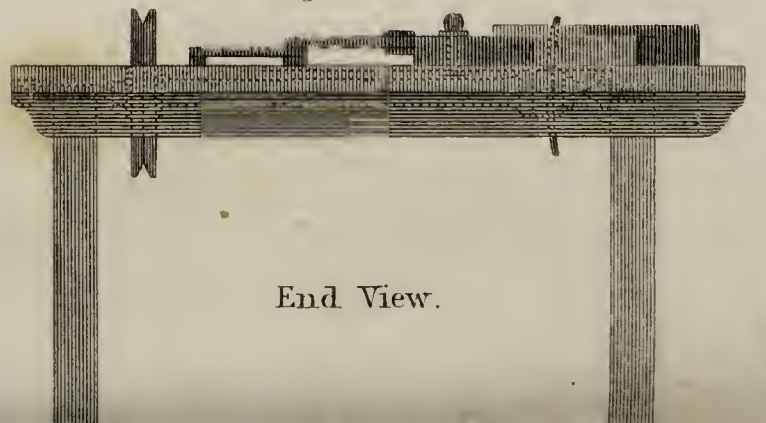


Fig: 4.



Saw & Axle.

Fig: 3.



any other way, as by the publicity which the Society is able to give to improvements deserving of its notice.

The improvement of this simple instrument has cost Mr. Hardie much time, and even expense; and he will be glad to receive any remuneration from the Society which they may think his invention deserves.

I am, Sir,
Your most humble Servant,
A. TILLOCH.

Carey Street, Feb. 21, 1806.

To C. TAYLOR, M. D.

Twenty-three persons testified by their signatures and subscriptions to Mr. Hardie their approbation of his Cutting Press.

The Society has received a Certificate from Lord DOUGLAS, who very strongly recommends Mr. Hardie's press in preference to the one in common use.

Reference to the Engraving of Mr. J. Hardie's Bookbinder's Cutting Press. Plate V. Fig. 5.

THE principal difference between this and the press which has been for time immemorial employed by the bookbinders, consists in effecting the business by one iron screw instead of two wooden ones formerly used. This screw works in a nut let into and screwed to the top piece A, its lower end working in a collar, screwed to the moving piece B, sliding in grooves within the two sides of the frame. C C are the guides for the plough, as in the common press.

The GOLD MEDAL, *or* FORTY GUINEAS, *at the Option of the Candidate, were this Session adjudged to* Mr. NEIL SNODGRASS, *of Johnstone, County of Renfrew, Scotland, for a* MODE *of* HEATING ROOMS *by* STEAM.

The following Accounts were received from him, and the pecuniary Reward paid to him at his desire.

An explanatory ENGRAVING *is annexed, and large* DRAWINGS, *upon an accurate Scale, may be seen at the Society's House.*

SIR,

THE undersigned memorialist having several years since invented, and successfully put in practice, a method of heating rooms, which he flatters himself will be found to fulfil the conditions for reward required by the Society, begs leave to propose himself as a candidate for the honour of such reward.

NEIL SNODGRASS.

Johnstone, Feb. 18, 1805.

To C. TAYLOR, M. D.

Reference to the Engravings, Plate VI. *of Mr. Snodgrass's Method of Heating Rooms by Steam.*

THE proposed mode of heating rooms will, perhaps, be most distinctly explained by a brief history of the first ideas of the memorialist on the subject; of his attempts to put them into practice; and of the successive improvements which have been suggested to him by experience.

In April 1798 he was engaged by G. Macintosh and David Dale, Esqrs. to manage a cotton mill near Dornoch,

in

in the county of Sutherland. He remained in Glasgow for six months after this, superintending the construction of machinery for the mill. During this period he was led to consider of a cheap method of heating the mill, as he had learnt that fuel was extremely scarce and dear in the country in which the mill was situated. It was evident that none of the methods which he had seen practised could be applied, but at an enormous expense; and his experience had pointed out to him important defects and inconveniences in them all. Having observed a mode of drying muslins by wrapping them round hollow metal cylinders, filled with steam, practised at the bleach-fields near Glasgow, it occurred to him, that by means of a proper apparatus, steam might be applied to heat a cotton mill, or any other large manufactory. It was evident that this not only would be an economical mode of producing heat in large works, so far as fuel was concerned, but that it would prevent the danger of fire, to which such works, when heated in the usual manner, are much exposed. He communicated his notions to a number of cotton spinners and others, from whose suggestions he expected assistance. But he met with nothing but discouragement, the project being every where treated lightly, or pronounced to be impracticable. Strongly impressed, however, with the advantages of the plan, the memorialist persevered in his resolution to make trial of it, and ordered tin pipes to be made for the purpose. These he erected in the mill in May 1799. When filled with steam they at once produced the necessary degree of heat; but the pipes, having been damaged in the carriage, proved not sufficiently strong. Indeed the memorialist was immediately sensible, that their position was unfavourable. With a view to some conveniences in point of room, they had been carried up diagonally in one end of the mill, whence the upper sides of the pipes be-

came sooner heated than the lower, which caused an unequal expansion. The water arising from the steam condensed in the pipes in its return to the boiler, and also obstructed the steam in its ascent. In order to remedy these defects the pipes were altered, and erected in a perpendicular position, and certain tubes were connected with them, to carry off the water arising from condensation. The whole apparatus, as it stood after this alteration, is represented by the drawing, Fig. 1.

This drawing presents a view of an inner gable, which is at one extremity of the preparation and spinning rooms of the mill. On the other side of this gable there is a space of 17 feet enclosed by an outer gable, and containing the water wheel, the staircase and small rooms, for the accommodation of the work. In this space the furnace and boiler are placed on the ground. The boiler cannot be shown here, as it lies behind the gable exhibited; nor is it of any consequence, as there is nothing peculiar in it. It may be of any convenient form. The feeding apparatus, &c. are in every respect the same as in the boiler of a common steam engine. A circular copper boiler, two feet diameter, by two feet deep, containing 30 gallons of water, with a large copper head, as a reservoir for the steam, was found to answer in the present instance. The steam is conveyed from the boiler through the gable, by the copper pipe B, into the tin pipe C, C. From C it passes into the centres of the perpendicular pipes E, E, E, by the small bent copper tubes D, D, D. The pipes E, E, E, are connected under the garret floor by the tubes F, F, for the more easy circulation of the steam. The middle pipe E is carried through the garret floor, and communicates with a lying pipe 36 feet in length (the end of which is seen at G,) for heating the garret. At the farther extremity of the pipe G, there is a valve falling inwards to prevent a vacuum being

ing formed on the cooling of the apparatus; the consequence of which would be the crushing of the pipes by the pressure of the atmosphere. Similar valves, K, K, are placed near the top of the perpendicular pipes E, E; and from the middle one E, the small pipe passes through the roof, and is furnished with a valve at I, opening outwards, to suffer the air to escape while the pipes are filling with steam, or the steam itself to escape when the charge is too high.

The water condensed in the perpendicular pipes E, E, E, trickles down their sides into the three funnels L, L, L, the necks of which may either pass through, or round, the pipe C, into the copper tube M, M, which also receives the water condensed in C, C, by means of the short tubes N, N. The pipe C, C, is itself so much inclined as to cause the water to run along it to the tubes N, N, and the pipe G in the garret has an inclination of 18 inches in its length, to bring the water condensed in it back to the middle pipe E. The tube M, M, carries back the water through the gable to the boiler, which stands five feet lower than this tube. It is material to return the water to the boiler, as, being nearly at a boiling heat, a considerable expence of fuel is thereby saved.

The large pipes are ten inches in diameter, and are made of the second kind of tinned iron plates. The dimensions of the smaller tubes are seen by their comparative size in the drawing, and perhaps they might be varied without inconvenience.

The apparatus erected as here described, has been found sufficiently strong, and has required no material repairs since the first alterations were made. The leading object in the instance under consideration being to save fuel, in order to derive as much heat as possible from a given quantity of fuel, the flue from the furnace, which heats the

boiler, is conveyed into common stone pipes placed in the gable. These are erected so as to prevent any danger of fire, in the manner shown in the drawing, Fig. 2. The steam with this auxiliary communicates a heat of about 70° to the mill, the rooms of which are 50 feet long, 32½ feet wide, and 8½ feet high, except the lower story and garret; the former of which is 11, and the latter 7 feet high. The rooms warmed in this manner are much more wholesome and agreeable than those heated by the best constructed stoves, being perfectly free from vapour or contaminated air.

By various experiments it appears, that the expense of fuel is scarcely one half of what is necessary to produce the same degree of heat with the best constructed stoves. The memorialist was the better able to make the comparison, since he had previously had five years experience of cotton mills on what was, at that time, reckoned the most approved plan.

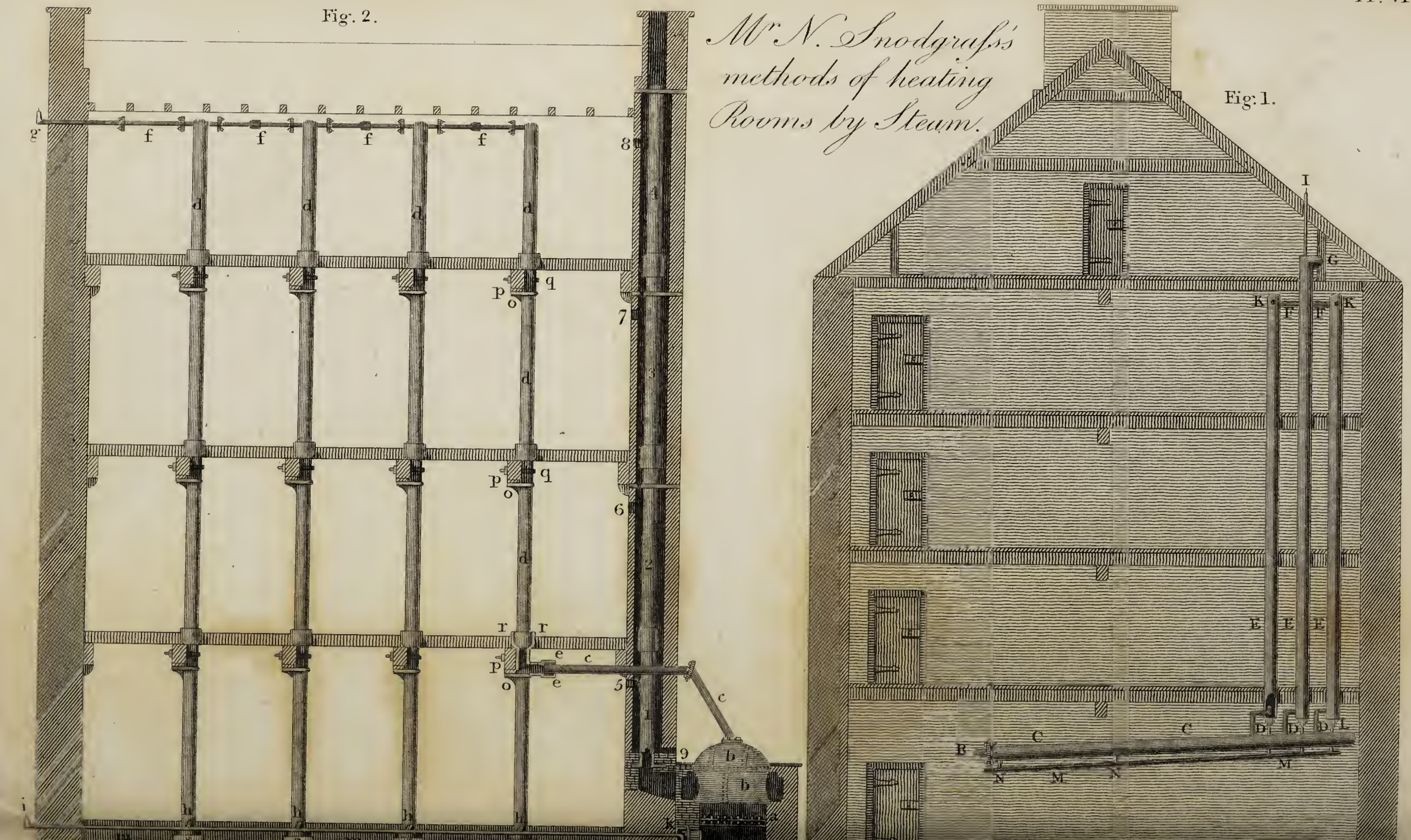
After having ascertained these results, the memorialist, in 1800, drew a plan similar to that now presented to the Society, and sent it to Glasgow to his employers, who were very doubtful of the success of the scheme. They immediately published the discovery in the Glasgow newspapers, inviting cotton spinners, and others interested, to inspect the plan. In consequence of this public intimation of the method having been successfully practised, a number of cotton spinners turned their attention to it, and adopted it with various modifications, according to the convenience of their mills, or their notions of improvement.

The memorialist afforded to every person who desired it, all the information on the subject which he possessed. His general recommendations were to detach the condensed water, in returning it to the boiler, as much as possible from

Fig. 2.

Mr. N. Snodgrass's methods of heating Rooms by Steam.

Fig: 1.



from the steam; and where tin pipes, or others of similar strength, were used, to secure them carefully with safety valves.

There are obvious defects in the application of the principle, as practised in the instance described above. Of some of these the memorialist was perfectly aware at the time of the first construction of the apparatus, though it was out of his power to remedy them; and he has thought it proper to give a detail of the first successful experiment exactly as it took place.

From the pipes being all in one end of the house, the heat was unequally diffused, and a considerable time elapsed, after their being first heated, before it reached the other end of the rooms. But, as the mill had barely room enough for the spinning machinery, it was impossible to erect the pipes in any other situation, or to convey them along the rooms, so as to produce a more equal distribution of heat. This, however, can be so easily effected, when there are no obstacles, such as have been mentioned, that it is scarcely necessary to enter into any detail of the means. It may be barely mentioned that the memorialist has fitted up the apparatus in two cotton mills, which are now under his management, belonging to George Houston, Esq. and Co. of Johnstone, in a manner which completely distributes the heat. In one of these mills, consisting of six stories, a lying pipe of cast iron, 5 inches in diameter, is carried along the middle of the lower story, about two feet from the ceiling, with a small declivity to carry off the water. This pipe heats the story in which it is placed. Tin pipes, $7\frac{1}{2}$ inches diameter, communicating with this lying pipe, are carried up perpendicularly through all the floors to the top of the house at the distance of seven feet from each other, and form a line of heated columns in the middle of each room.—The same general plan has been followed in the other mill. But there

are several irregularities in the building, which require a little variation of the contrivances for diffusing the heat to every quarter. Some of the rooms having been added since the first erection of the mill, are connected with the main body of the building awkwardly. Into these the steam is carried by lying pipes, slightly inclined, and communicating with the principal apparatus. The steam may afterwards be distributed by other pipes in any way that is thought convenient. The memorialist has found no difficulty in conveying, by such means, the steam necessary to produce the degree of heat required in every variety of situation.

In the former of the last mentioned mills, the perpendicular pipes are connected under the ceiling of the garret by a pipe $2\frac{1}{2}$ inches diameter, slightly inclined, the extremities of which pass through the walls of the house, and are provided with valves opening outwards. A connecting pipe, with similar valves, is placed under the ceiling of the third story. These are intended for the more easy circulation of the steam: but the memorialist found, from experience, that with all these aids, the filling of the perpendicular pipes with steam was attended with some difficulty. The steam, when first thrown in, passes up the perpendicular pipe nearest to the boiler, and, being specifically lighter than air, occupies the upper part of the apparatus, compressing the air in the lower part of the rest of the pipes. The resistance of the air will thus for a long time prevent the pipes from being completely heated: but this difficulty is easily obviated by having a valve or valves opening outwards, at the lowest part of the apparatus, through which the air, when compressed by the steam, is suffered to escape. In the mill just mentioned, the lying cast iron pipe in the first story is carried through the gables of the mill, and furnished with valves for the egress of the air. It is unnecessary to repeat, that the same valves serve for the discharge

discharge of the air in heating the apparatus, and of the steam itself, when its expansive force becomes too great. In both mills each of the perpendicular pipes is provided with a valve, to prevent a vacuum; and in the second mill the lying pipes for carrying the steam into the detached rooms have each two valves, one opening inwards, and the other outwards.

Certificates of five other mills being heated in a similar manner, by the direction of the memorialist, are presented to the Society.

The application of the principle to buildings already constructed, it is presumed, will be sufficiently obvious from the foregoing details. In new manufactories, where the mode of heating may be made a part of the original plan, a more convenient apparatus may be introduced. This will be best explained by a description of the drawing, Fig. 2. which gives a section of a cotton mill constructed in a manner which the memorialist would adopt, were he to apply the steam apparatus to a new building, or any other that would permit such an apparatus from its regular constructions. In an old mill in this place, an apparatus is now erecting by the advice of the memorialist, conformable to this plan, which is likely to be generally adopted in new cotton mills.

The furnace for the boiler is shown at *a*. The flue of the furnace conveys the smoke into the cast iron stove pipes, 1, 2, 3, 4. These pipes are placed in a space in the gable, intirely enclosed with brick, except at the small apertures, 5, 6, 7, 8. A current of air is admitted below at 9, and thrown into the rooms by those openings, after being heated by contact with the pipes. This part of the plan is adopted with a view to prevent, as much as possible, any of the heat, produced by the fuel used, from being thrown away: It may be omitted where any danger of fire is apprehended from

from it, and the smoke may be carried off in any way that is considered absolutely secure. So far, however, as the memorialist is able to judge, there seems to be little or no danger of fire from a stove of this construction. The greatest inconvenience of a common stove is, that the cockle or metal furnace is liable to crack from the intensity of the heat. By the continuity of the metal from the fire-place, an intense heat is also conducted along the pipes, which exposes them to the same accident. Here the smoke being previously conveyed through a brick flue, can never communicate to the pipes a degree of heat sufficient to crack them. In like manner the pipes, having no communication with the rooms but by the small apertures, cannot come in contact with any combustible substance; and from being surrounded with air, which is constantly changing, can impart only a very moderate degree of heat to the walls. The iron supporters of the pipes may be imbedded in some substance which is a bad conductor of heat, as furnace ashes and lime, &c. The emission of heated air into the rooms may be regulated by valves. As the pipes are not exposed to cracking, there is no risk of their throwing smoke or vapour into the rooms.

The boiler *b*, *b*, is six feet long, three and a half broad, and three feet deep. As there is nothing peculiar in the feeding apparatus, it is omitted. The boiler may be placed in any convenient situation. Where a steam engine is used for other purposes, the steam may be taken from its boiler. The pipe *c*, *c*, conveys the steam from the boiler to the first perpendicular pipe *d*, *d*, *d*. There is an expanding joint at *e*, stuffed, to make it steam tight. The steam ascending in the first pipe *d*,*d*,*d*, enters the horizontal pipe *f*,*f*,*f*,*f*, (which is slightly inclined) expelling the air, which partly escapes by the valve *g*, and is partly forced into the other pipes. The valve *g* being considerably loaded, forces the accumu-

accumulating steam down into the rest of the pipes *d*, *d*, *d*. The air in these pipes recedes before the steam, and is forced through the tubes *h*, *h*, *h*, into the pipe *m*, *m*, *m*, whence it escapes at the valve *i*, and the syphon *k*. The water, condensed in the whole of the pipes, passes also through the tubes *h*, *h*, *h*, *h*, into the pipe *m*, *m*, *m*, which has such a declivity as to discharge the water at the syphon *k*, into the hot well *n*, whence it is pumped back into the boiler.

The whole of the pipes are of cast iron, except *m*, *m*, *m*, which is of copper. The perpendicular pipes serve as pillars for supporting the beams of the house, by means of the projecting pieces *o*, *o*, *o*, which may be raised or lowered at pleasure by the wedges *p*, *p*, *p*. The pipes are sunk in the beams about an inch, and are made fast to them by the iron straps *q*, *q*. Those in the lower story rest on the stones *s*, *s*, *s*, *s*, and are made tight at the junction with stuffing. The pipe in each story supports the one in the story above by a stuffed joint as shown at *r*. The pipes in the lower story are seven inches in diameter; those in the higher six inches; those in the other two are of intermediate diameters. The thickness of the metal is $\frac{3}{8}$ of an inch. The lower pipes are made larger than the upper, in order to expose a greater heated surface in the lower rooms, because the steam being thrown from above into all the pipes, except the first, would otherwise become incapable of imparting an equal heat as it descends.

There is no necessity for valves opening inwards in this apparatus, the pipes being strong enough to resist the pressure of the atmosphere.

The cotton mill is 60 feet long, 33 wide, and four stories high, the upper being a garret story. In the engraving five parts out of nine in the length of the building are only shown. The apparatus will heat the rooms to 85° in the coldest

coldest season. It is evident that, by increasing the size, or the number of the pipes, and the supply of steam, any degree of heat up to 212° may be easily produced. It may even be carried beyond that point by an apparatus strong enough to compress the steam; this, however, can seldom be wanted. At first it was objected to this construction, that the expansion of the pipes, when heated, might damage the building; but experience has proved, that the expansion occasioned by the heat of steam is quite insensible.

The memorialist thinks it would be improper, in addressing so intelligent a body as the Society of Arts, &c. to expatiate on the various economical purposes to which the principle, which he has been able but imperfectly to unfold, may be applied. In abler hands it may be found susceptible of improvement, which he cannot anticipate.

NEIL SNODGRASS.

Certificates from Mr. GEORGE MACINTOSH, and Messrs. HENRY MONTEITH, BOGLE and Co. of Glasgow; Mr. GEORGE HOUSTON, Messrs. ROBERT HODGART and Co. Messrs. JOHN FIFE and Co. and Mr. JOHN M'NAUGHT, of Johnstone; Mr. JAMES BOYLE, manager for Messrs. M'FARLAM, BLACK and Co. at Gryse-Mill; also from Mr. WILLIAM KERR, for the Lochwinnoch Spinning Company, confirm the utility and success of Mr. SNODGRASS's method, and attribute to him the credit of first applying steam to the purpose of heating manufactories.

The

The SILVER MEDAL *was this Session voted to* Mr. G. FIELD, *of Newman Street, for a* STOVE, *for* HEATING ROOMS, *or* DRYING DIFFERENT ARTICLES.

The following Communication was received from him; an explanatory ENGRAVING *is annexed; and a* MODEL *upon this Principle is preserved in the Society's House.*

SIR,

I HAVE the honour of enclosing a plan and account of a stove, which unites the various advantages of heating, boiling, steaming, evaporating, drying, ventilating, &c. These, together with a certificate and model of the stove, I beg the favour of you to lay before the Society.

I have the honour to be,

Your most obedient servant,

GEO. FIELD.

No. 87, *Newman Street, March* 11, 1806.

To Dr. C. TAYLOR,

Secretary, &c.

Description of the Stove.—Plate VII. Fig. 1, 2, 3.

Fig. 1. Represents a longitudinal section of the stove, showing the course of the air from its entrance into the flues of the stove at A, to its entrance into the upper chamber of the stove at B: and also the course of the smoke from the fire-place at C, till it escapes from the stove at D. E, E, are the doors or openings of the fire-place and ash-hole.

Fig. 2. Is a similar section at right angles with the above, exhibiting the course of the air through the chambers of the stove, from its entrance into the chamber No. 1.

at

at B to its entrance beneath the fire-place at F. This figure also shows sections of the flues, with the divisions through which the air and smoke pass separately, the smoke flue in the centre, and the air flues on each side. G, G, are doors and openings through which the articles to be dried are introduced into the chambers.

When the fire is lighted, and the doors of the chambers, ash-hole, and fire-place, closed, the air by which the fire is supplied enters at A, Fig. 1, passes through the air-flues *a*, *a*, *a*, *a*, enters the upper chamber at B, traverses and descends through the chambers No. 1, 2, 3, and arrives beneath the fire at F, Fig. 2. Having supplied the fire with oxygen, it passes through the flue with the smoke, and escapes at D, heating in its protracted course the chambers and air-flues.

As the cold air enters the stove at A, immediately above a plate forming the top of the fire-place, and pursues a similar route with the fire-flue, it enters the chambers very much heated and rarefied. Hence any moist substance placed in the chambers evaporates in consequence, not only of the heated flues circulating round them, but of a stream of warm rarefied air, which, while it continually raises evaporation, as continually bears away the exhaled moisture in its passage to the fire, thus imitating the gradual and efficacious plan of nature in drying by the sun and air. While these effects are taking place within the stove, part of the air which enters at A, Fig. 1 and 2, passes through air-flues on the other side of the fire-flue, pursues a parallel course with the first, and gives out a current of warm air to the room at an aperture H. This effect may be obtained in a much higher degree, if the doors of the chambers and ash-hole are opened: should the hand or face be then brought near, they would be fanned with a stream of warm air, especially from the upper chamber.

By

Mr. G. Field's Stove for heating or Drying.

Fig. 1. Side

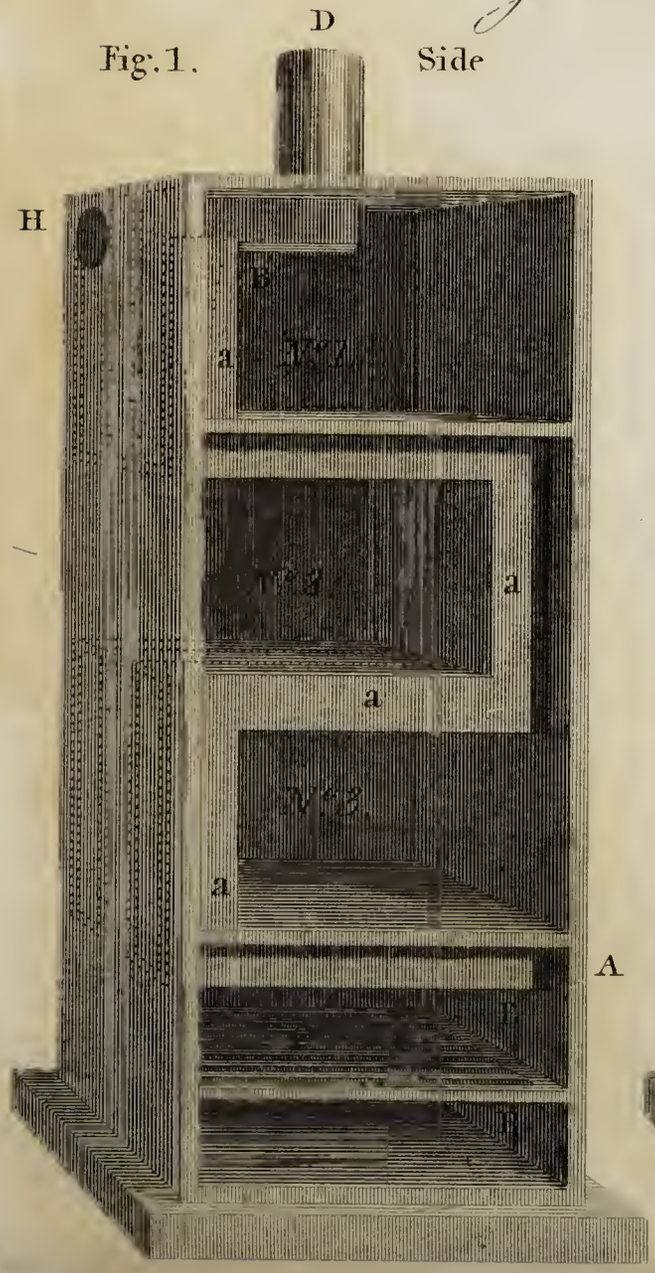


Fig. 2. Front

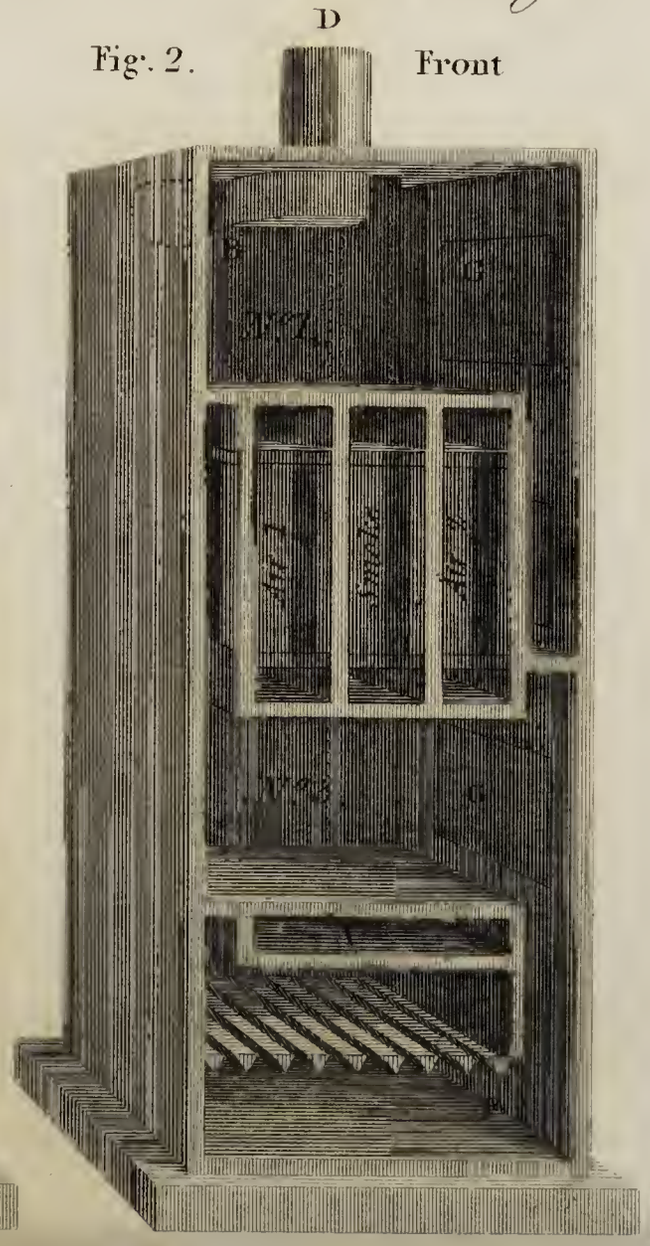
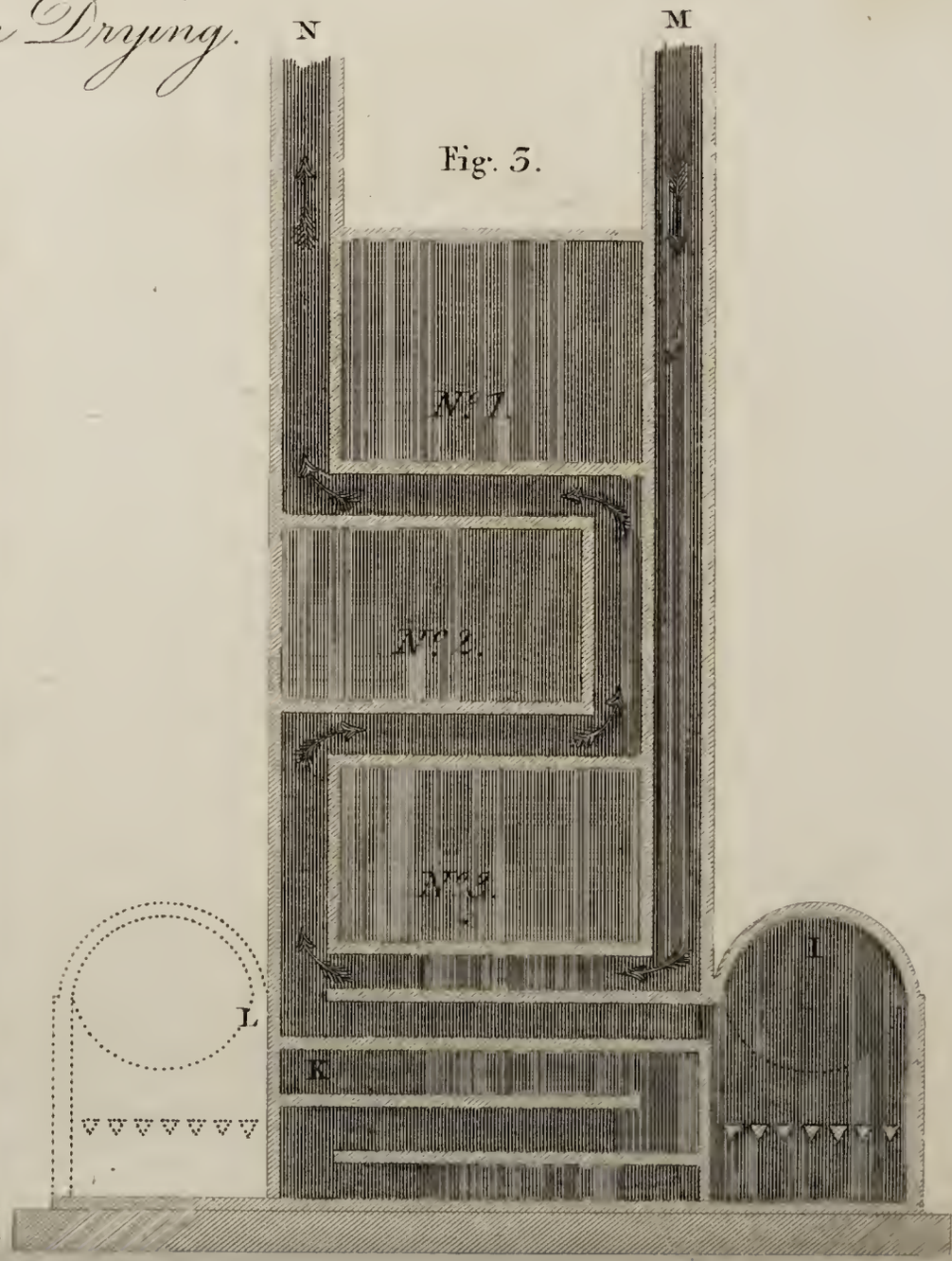


Fig. 3.



By means of this stove I have evaporated milk to dryness, without burning or discolouring it ; and have dried cherries, plums, and other fruits, so as to imitate those which are received from abroad. I have repeatedly dried colours and the most delicate substances without the slightest injury to them, even though the operation proceeded quickly,

The height of the stove is about 5½ feet ; its diameter 2½ feet, and that of the flues 4 inches. The external part is constructed of brick, and the internal parts of thin Ryegate or fire-stone, except the top of the fire-place, which is a plate of cast-iron. Were it to be wholly formed of iron, its effects would necessarily be more powerful.

Fig. 3. Represents an extension of the plan, in which stoves of this kind may be advantageously connected with one or more furnaces for chemical or other uses. The fire-place, brought out, either in front or on one side, by the present position of its crown I, forms a reverberatory furnace, or will make a sand-bath by reversing it.

The space occupied by the fire-place in Fig. 1, may in this be converted into apartments for evaporating substances, or occasionally for cooling them by an opening at K to admit cold air, while the warm air of the stove is excluded by a register or door. The dotted lines show the manner in which a second furnace may be connected by an opening into the flue at L.

In addition to the uses already pointed out, this stove would probably be found extremely serviceable in drying japanners' goods, and consuming the noxious fumes and gas which arise from the oil and varnish used in this business.

Since the stove is not limited to any certain dimensions, it might be adapted to the drying of malt and hops, perhaps of herbs, corn, and seeds generally. It might also be accommodated

modated to the purposes of the sugar-bakers, connected with the great fires they employ for their boilers. It has been shown to be useful in the confectioners art, and probably it may be equally so in baking biscuits for the navy; nor less so in drying linen for the laundress, dyer, calico-printer, and bleacher. I have myself found it well accommodated for a chemical elaboratory.

The efficacy of the stove in ventilating, boiling, and steaming may easily be shown. In manufactories and rooms generally, the heated and noxious part of the atmosphere ascends towards the ceiling: if then the air-flue M, Fig. 3, is continued upward according to the height of the room in which it is placed, the air will be drawn from the top, and the room become ventilated, while from the opening at N it is supplied, if requisite, with warm air.

It is unnecessary to show the various ways in which a boiler may be connected with this plan: it is sufficient to observe, that in the space allotted for the fire-place in Fig. 1, there is sufficient room within the body of the stove for this purpose; and that if the circulating air be made to pass over the boiler, evaporation may be carried on very expeditiously by the air removing the vapour as it arises. Finally, if another division of the flues be made in the manner shown Fig. 2, it might form a steam-pipe or flue, running the course of the air and fire-flues to convey steam to one or more apartments of the stove; or extended beyond the stove for heating the room in which it stands. One of the air-flues might occasionally be adapted to this use. It is obvious that the power of steam in a heated apartment, would be not only greater, but better kept up. In steaming it would be necessary to close the apartments of the stove, and to give air to the fuel by a different course.

As the stove is not confined in its dimensions, so neither is it necessarily of the form described in the drawing, nor

nor are the apartments necessarily three: all these particulars admit of variation according to local or other circumstances. It is evident that the air-flues themselves may be converted into chambers for drying, &c.; and the fire-place of Fig. 3 is well adapted to receive an apparatus for the decomposition of coal, &c.; for producing all the effects of the thermo-lamp, or illuminated smoke, &c. But it is needless to enumerate the many economical and philosophical uses to which the stove may be applied. It is sufficient for the present purpose if I have rendered the principle and plan intelligible, the artist and manufacturer will then be at no loss in adapting it to the particular object, which he may require it to accomplish.

A Certificate from Mr. S. SELLERS, Chemist, Broad-Street, Bloomsbury, accompanied this communication, stating that the effects of the stove in question, are as Mr. Field has described them in his paper addressed to the Society.

TWENTY GUINEAS *were voted this Session to* Mr. BENJ. STOTT, *of Bermondsey Street, for his Invention of a* MACHINE *for* SPLITTING SHEEP-SKINS.

The following Communication was received from him; and a Model of the Machine is preserved in the Society's Repository.

GENTLEMEN,

I HAVE invented an engine for the purpose of splitting sheep-skins, that is, of making two good skins out of one. The former and common mode of dressing skins, is to

shave one side off, reserving the shavings for glue pieces; whereas by my method, these shavings are all taken off in one piece, forming a good skin of leather; and thus, independently of the advantage arising to the proprietor, an additional revenue will be caused to the nation, in proportion to the increase of leather made.

I am, Gentlemen,
Your most obedient humble Servant,
BENJ. STOTT,
At Mr. Wm. Ellis's, the Sign of the Plough, Fryers'-Gateway, Bermondsey Street, Borough.

January 18, 1806.

To Dr. C. Taylor.

Reference to the Engraving of Mr. Stott's Method of Splitting Sheep-Skins. Plate VIII. Fig. 1, 2, 3, 4.

Fig. 1. A, the barrel of cast-iron (having wooden ends) round which barrel the skin is wrapped, and kept close by means of pins run through the edges into the wood, as at *e*, *e*, Fig. 2. B, (Fig. 1) an iron running in a groove along the barrel, catching in a hole at *c*, and fastened down at the other end by a hook fixed in the end of the barrel, the bar having points in it (as shown at B, Fig. 3,) under which the edges of the skin are fastened (as seen at D, Fig. 2). F, F, (Fig. 1 and 2) bars fixed across each end of the strong wooden frame G, G, G, G, over which the barrel is supported on friction-rollers, as at *h*, *h*, (Fig. 2) which run on a slip of brass, moveable under the screws *i*, *i*, to adjust the barrel to the knife. K, K, (Fig. 1 and 2) a strong bar of cast iron, to which the knife is screwed, moving lengthwise on friction-rollers between the pieces of wood L, L, L, L, on the frame G, as at K, (Fig. 4). The pieces of wood L, L, L, L, are each moveable under two screws,

Mr. Stotts Machine for Splitting Skins.

Fig. 3.

Fig. 1.

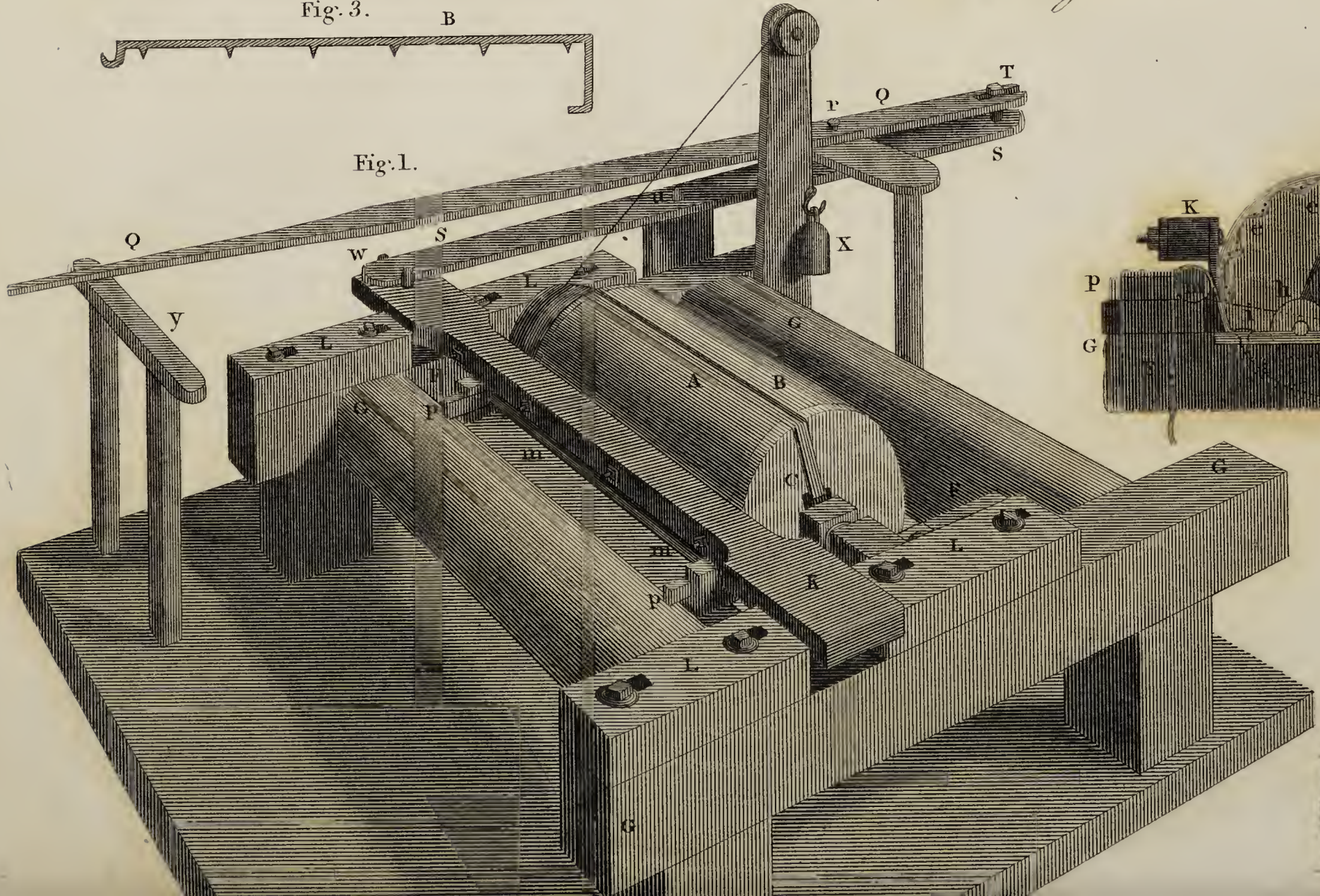


Fig. 2.

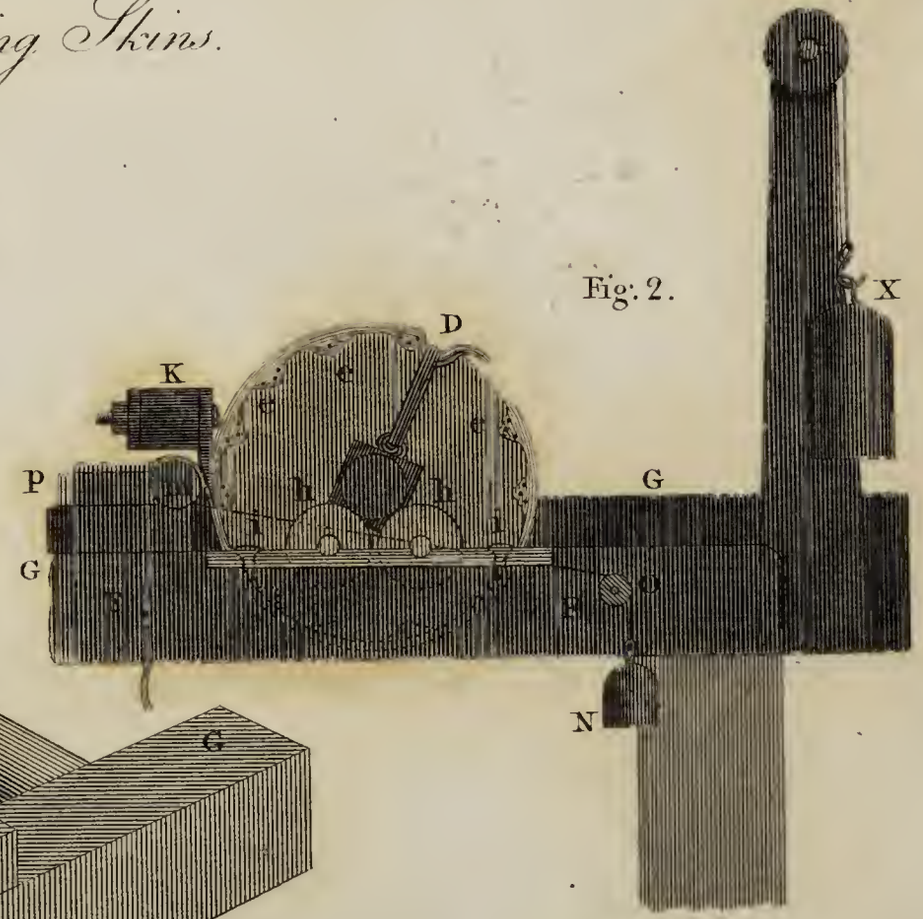
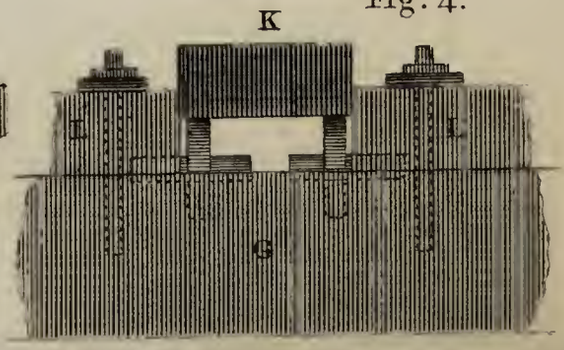


Fig. 4.



screws, by which they are adjusted to steady the motion of the knife-bar. M, M, (Fig. 1 and 2) is a roller at the back of the knife, to which it is kept close by a weight N, at each end, acting over pulleys, as at O, (Fig. 2) suspended from the slider *p*, between which the roller is placed; by drawing the spare skin over this roller, as it is cut off, it keeps both sides of the skin equally up to the knife, and makes it cut more uniform. Q, Q, is a lever acting on a pin *r*, and moving another lever S, S, by means of a pin and a notch *t*, which acts on another pin at *u*; and by means of the two pins at W it moves the knife lengthwise to and fro: as fast as the skin is cut the barrel is drawn round by the weight X. *y* is a guide to the lever, from which end it is worked.

The Honorary SILVER MEDAL *was this Session voted to Mr.* JOHN MIDDLETON, *of St. Martin's Lane, for Improvements in* PRINTING PAPER-HANGINGS.

The following Communication was received from him.

SIR,

HAVING invented a machine for the purpose of printing Paper-Hangings, by which the printer works with greater facility and dispatch than in the usual way; and the tere-boy, who could with great difficulty serve one sieve, can, by means of this invention, serve two with ease to himself; I should be glad to submit it to the inspection of any committee, which the Society may nominate.

I am, Sir, respectfully,

Your obedient and humble Servant,

JOHN MIDDLETON.

St. Martin's Lane, Jan. 29, 1806.

To Dr. C. TAYLOR, Sec.

Reference to Mr. Middleton's Apparatus for facilitating the Operations in Paper-Staining. Plate IX. Fig. 1, 2.

Method of Printing Light Grounds.

Fig. 1. A, the printer's table covered with a soft blanket. B, the woollen-cloth sieve on which the colour is laid and spread by a boy (called the Tere-boy) with a hair-brush. This cloth sieve is laid upon a leather sieve impervious to wet, and it floats upon some gum-liquor, in a wooden vessel C.

D, D, two cords 36 feet long, stretched from the table A to the other end of the room, and are kept tight by a weight at B.

F, F, an endless cord, passing round a grooved wheel G under the table, over a pulley H, in the side of the table, and over another I, at the other end of the room. Its use is to carry the cross-piece K, called the Traverse, which is fastened to it.

L, a wheel fixed on the same axis as the wheel G, but on the outside of the boarding of the table; it has three pegs projecting about four inches from its face. This wheel is moved by the printer setting his foot on one of the pegs.

Fig. 2. Is the traverse on a larger scale. M, M, are two pieces of wood connected by a hinge at N, and when closed are retained in that position by a ring O, put over the ends of them: it is connected with the endless cord, by a staple P on one side, and another staple on the other side, and slides along the cords D, D, by means of two pulleys R, R.

The operation of printing commences by putting one end of the paper to be printed (which is 12 yards long and 23 inches wide) between the divisions of the traverse (Fig. 2), and

and fastening it there by the ring O. The other part of the paper, except what lies on the printing-table, is wound round the roiler S. The workman takes up the printing-block with his right hand, dips the face of it on the woollen cloth in the sieve, which the tere-boy had previously spread with colour, and then places the block upon the paper to be printed, giving it two or three smart strokes with a leaden mall held in his left hand; he then removes the block to supply it with more colour from the sieve; and during this operation sets his left foot upon the peg in the wheel; and as he recovers his upright position to bring the block over the table, his foot presses the peg down into the position 2, which, by means of the wheel G, endless cord F, and traverse K, draws the paper forward on the table just the proper distance to print again. When the whole piece is printed, the tere-boy goes to the end of the room, loosens the paper from the traverse, and hangs it up to dry in folds, on loose sticks placed across racks attached to the ceiling.

Method of Printing Dark Grounds.

The table and sieve for the colour are the same as in printing light grounds. The difference of printing consists in applying the colour from the block upon the table, by means of a lever, instead of striking the block with a mall; the pressure of the lever forcing a greater quantity of colour upon the paper and in a more even manner.

T, the axle of the lever. Y, the arm (15 inches long) to which the power is applied by means of a rope U, fastened to it, which has a treadle W at its end, for the workman to place his foot upon. X, another arm (six inches long) to which is jointed Y, a long pole, whose end is applied to the back of the block 3, when the pressure is given.

Z, an arm on the other side of the axle T, to which a weight is hung to balance the pole Y.

Fig 3, Shows a section of the axle T with the arms V and Z projecting from it, and the manner in which the arm X is connected by a joint with the pole Y; the excellence of this principle depends upon the very great increase of power, which is given by bringing the pole nearer the centre of the joint or axis.

The paper being placed upon the table as in printing light grounds, and the workman having placed his block, furnished with colour, upon the paper to be printed, he puts his foot on the treadle W, attached to the cord U, takes the pole from behind the piece of wood 4, and applies its end upon the block U, and pressing down his foot makes the impression from the block upon the paper. He then lodges the pole behind the piece of wood 4, to be out of the way; he next removes the block to furnish it again with colour, and draws the paper forward for another impression, by the foot-wheel L, as described in the former mode.

TEN GUINEAS *were this Session voted to Mr.* JOSEPH DAVIS, *No.* 14, *Crescent, Kingsland-Road, for his Improvement in the* PAINTERS *and* GLAZIERS MACHINE.

The following Communication was received from him, and a MODEL *is reserved in the Society's Repository.*

SIR,

THE frequent accidents which happen to Painters and Glaziers, from the unsteadiness of their Machines, and the consequent misery brought upon their families, have stimulated me to endeavour at the improvement of such Machines.

The

Mr. Davis's Machine for Glaziers.

Fig. 4.

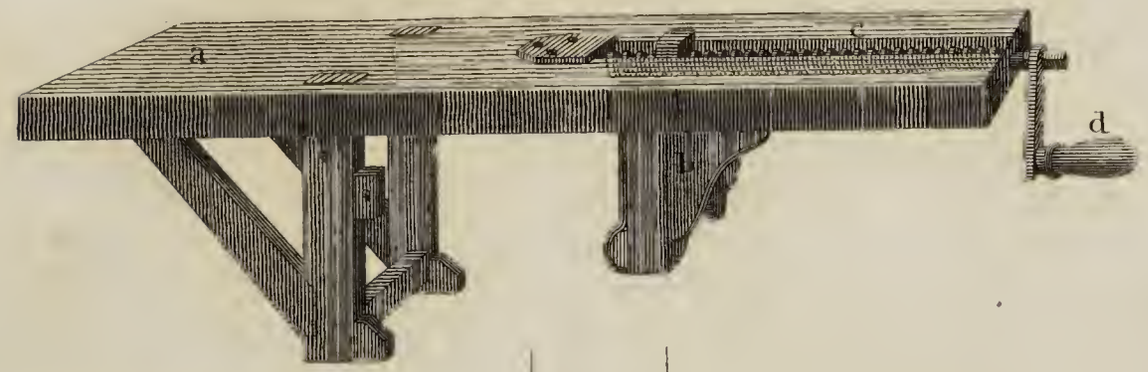


Fig. 6.

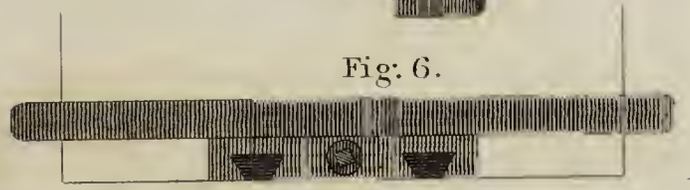
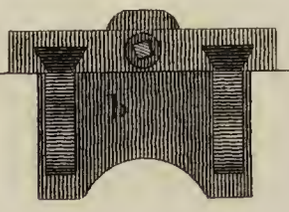


Fig. 5.



Mr. Middleton's Mode of Printing.

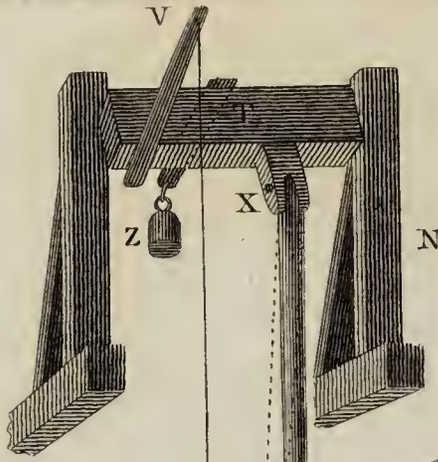


Fig. 2.

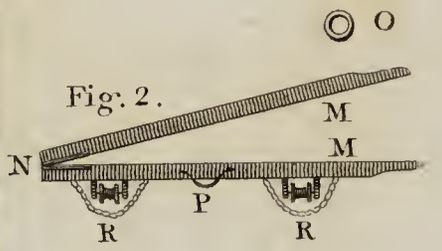


Fig. 3.

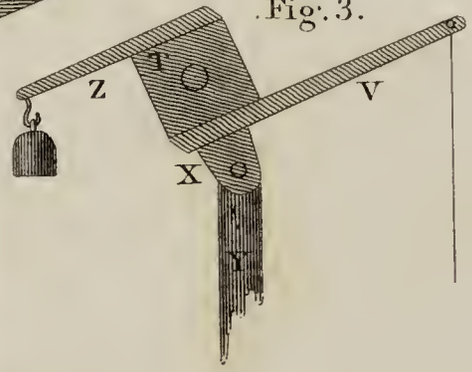
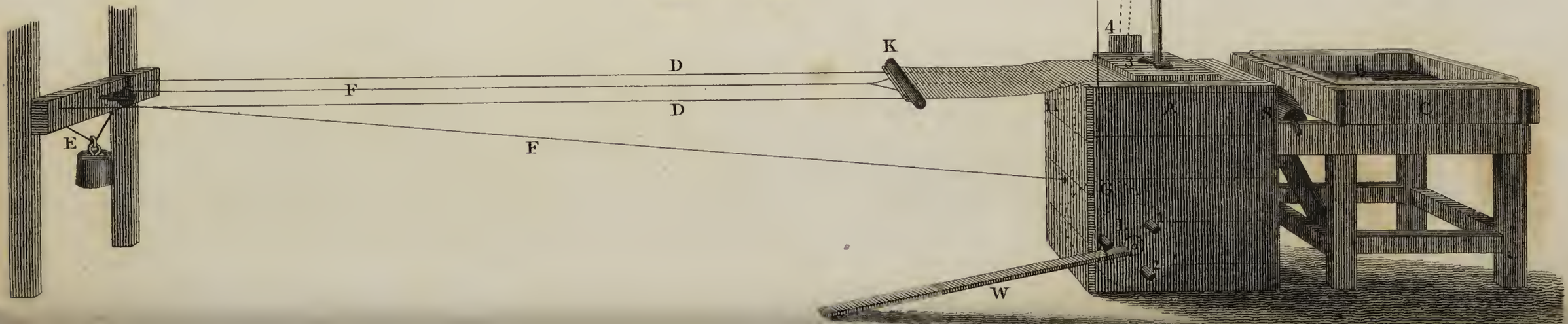


Fig. 1.



The model, which I have the honour of forwarding to you, will, in my opinion, answer the purpose in view. Generally, as you will see, the machine may be used without the guard; and while perfectly firm and secure, it will cause no injury to the wainscoting or paint. But where the windows are flush with the floor, and where no under security can be depended upon, the guard may be applied with advantage.

I have the honour to be,

Your very humble Servant,

JOS. DAVIS.

Crescent, Kingsland-Road, Nov. 25, 1805.

To Dr. C. TAYLOR.

Reference to Mr. J. Davis's Machine for Painters and Glaziers. Plate IX. Fig. 4, 5, 6.

Fig. 4. Represents the Machine; the part *a*, is similar to that used by glaziers, which is placed on the outside of the window. *b*, is an additional moving piece, which presses against the inside of the window-frame, and is brought nearer to, or removed farther from it, by means of the male-screw *c*, and its handle *d*.

Fig. 5. Shows the lower part of a window, and the manner in which the moving-piece *b*, including a female-screw, acts against the inside of the window-frame.

Fig. 6. Shows a cross-bar introduced in place of the moving-piece last mentioned, which bar extends from one window-side to the other, and explains how the machine may be used, where any injury might arise from screwing the moving-piece in the centre of the recess of the window.

The general improvement consists in the use of a screw on that end of the frame which is within the house, and which keeps the machine steady and firm, instead of the two upright irons, which are put through holes made in the

top plank of the machine, in the common mode, and which occasion the machine to be very unsteady in use, and liable to accident. There are two blocks marked *d*, *d*, in Fig. 4, which may be occasionally put in, or taken out, according as the stone-work under the window may require.

COLONIES

AND

TRADE.

COLONIES AND TRADE.

The THANKS *of the Society were this Session voted to Dr.* WILLIAM ROXBURGH, *of Calcutta, for the following valuable Communications.*

Observations on the Culture, Properties and comparative Strength of Hemp, and other vegetable Fibres, the Growth of the East Indies; continued from page 396 of the 22d Volume of the Society's Transactions.

To prove the durability of the various materials formerly mentioned (see vol. xxii. page 382.), I had recourse to maceration in fresh water, during the hot season. The result of these trials will be found in the following table, which, in a great measure, corresponds with the former, showing the comparative strength of the various cords mentioned therein, by weights suspended by four feet lengths of them. The first three columns on the left have been explained in the first part of these observations; in this the largest cord only of each sort has been inserted. The three last on the same side express the average weight at which each sort of cord broke, after having been kept at the bottom of muddy, half putrid, stagnant pond water, from the 27th of February to the 22d of June, 1801.

Materials, or Names of the Plants which yielded them.	Average weight at which each sort of cord broke.					
	When fresh.			After 116 days maceration.		
	White	Tanned.	Tarred.	White.	Tanned.	Tarred.
1 Hemp from England....	105	—	—	—	Rotten	—
2 Ditto growth of India.	74	139	45	A	Rotten	—
3 Coir.....	87	—	—		—	—
4 Ejoo.....	96	—	—	94	—	—
5 Robinia cannabina, ripe..	88	101	8 4	40	56	65
6 The same cut while blossoming.....	46	61	48	Rotten	68	45
7 Crotalaria juncea.....	68	69	60	Rotten	51	65
8 Corchorus olitorius.....	—	—	—	—	—	—
9 Corchorus capsularis....	67	—	—	50	—	—
10 Flax, growth of India..	39	—	—	Rotten	—	—
11 Agave Americana.....	110	79	78	Rotten	Rotten	15½
12 Aletris nervosus.....	120	73	48	30	26	34
13 Theobroma Augusta Linn.	74	58	44	38	54	50
14 Theobroma guazuma, Hort. Cliff.....	52	47	45	30	39	—
15 Hibiscus tiliaceus.....	41	62	61	40	55	70
16 Hibiscus Manihot.....	61	—	—	26	—	—
17 Hibiscus mutabilis,....	45	53	—	Rotten	45	—
18 Hibiscus, from Cape of Good Hope.....	22	—	—	17	—	—
19 Bauhina, a scandent species.....	69	—	—	Rotten	—	—
20 The same, but differently prepared.....	56	—	—	Rotten	—	—
21 Sterculia villosa.....	53	—	—	30	—	—

Stagnant fresh water in a rather putrid state, during the hot months of March, April, May, and June, in Bengal, must be as severe a trial for vegetable fibres, as can be well found in any country. I am exceedingly glad to find that in general the fibres of our East Indian plants, stood the test infinitely better than hemp from England, or of hemp or flax the growth of Bengal.

Tar appears in general to be a better preservative than tan during the immersion, though I was formerly inclined to think otherwise. The powers of No. 4, to resist decay, correspond

correspond with what the Dutch historian Rumphius says of it in his Herbarium Amboynense. Nos. 7, 8, 9, and 13, 14, retained their strength surprisingly. No. 15, (the bark with which the inhabitants of the South Sea islands make lines), gained considerably in power in its tarred state.

In the former part of these observations, it was remarked, that numerous plants, exclusive of those which yield hemp and flax, were productive of fibres apparently well qualified for the same useful purposes; and these several sorts are pointed out, some of which had been long and well known to the natives of Asia: others appeared to me to be unknown to them. Since the date of that paper, my researches have brought to light several additional objects of the same nature, and added considerably to the imperfect knowledge I then had of others. At the close of my first experiments (vol. xxii. page 395-6) mention is made of the strength of sun cords being greatly increased while thoroughly wet with fresh water. From 100 to 200 additional experiments have been made since that time, to illustrate this interesting fact, the result of which will be found in the two last columns of the annexed table.

The cords now employed were made of three single yarns; and, as formerly, by no means so equally spun, or laid, as might have been done, by an expert European artist: nor must their strength be compared with those of the same material in the former table, because the cords are now made considerably stouter, and the yarns are, in general, better laid, on account of their being thicker; for I suspect that the smallness of the lines employed in the former trials rendered them somewhat less accurate than the present.

Com-

COMPARATIVE STATEMENT *of the* STRENGTH *of the various* MATERIALS *employed in these* EXPERIMENTS, *both dry and wet, by Weights suspended by Four Feet Lengths of the Cords.*

NAMES *of the* PLANTS, *or* MATERIALS *used, and brief* REMARKS *thereon.*	Average Weight by which each Cord broke when dry.	Average Weight by which each Cord broke when wet.	Average of Cents. by wetting the Cords.
1. Hemp, the growth of 1800, from the Company's hemp-farm, near Calcutta	158	190	20
2. Jeetee of the Rajemahl Mountaineers, the clean fibres of the bark of a new species of Asclepias	248	343	38
3. This cord is made of 15 threads of fine sail-twine from Bencoolen, the produce of a new shrubby species of nettle (Urtica)	240	278	16
4. Sun (Crotalaria juncea) cut before the plants were in blossom, and steeped immediately	112	158	41
5. The same, and cut at the same time; but the plant was dried, or rather kept for some days before it was steeped	60	78	30
6. The same, cut when in full blossom, and steeped immediately	130	185	42
7. The same as No. 6, and cut at the same time, but attempted to be cut before it was steeped	100	166	66
8. The same, cut when the seed was perfectly ripe, and steeped immediately	150	203	35
9. The same as No. 8, and cut at the same time, &c. as No. 5 and 7	110	163	48
10. Sun, the winter crop; the seed from the coast of Coromandel, cut when the seed was ripe, and steeped immediately	160	209	31
11. A Variety of Corchorus capsularis, Teetah-paat of the Bengalese, delicately fine like flax	143	146	2
12. Reddish Corchorus capsularis; the seed imported from China; also fine and soft like flax	164	164	0

NAMES *of the* PLANTS, *or* MATERIALS *used, and brief* REMARKS *thereon.*	Average Weight by which each Cord broke when dry.	Average Weight by which each Cord broke when wet.	Average of Cents. by wetting the Cords.
13. Corchorus olitorius, Bunghi-paat of the Bengalese, and very like the two last	113	125	11
14. Robinia cannabina, Dansha of the Bengalese, cut when the seed was nearly ripe	138	145	5
15. Abroma Augusta, Hort. Kew. (No. 13 of my former paper) young shoots before the flowers opened.	100	112	12
16. The same, from ligneous plants which had ripened their seed	121	121	0
17. Hibiscus strictus (No. 16 of my former paper, and then mistaken for Hibiscus Manihot) cut when early in blossom	104	115	10
18. The same, but cut when the seeds were perfectly ripe	128	135	5
19. Hibiscus cannabinus, Meesta-paat of the Bengalese, cut when in flower, and steeped immediately	115	133	15
20. The same, (Gong-kura of the Telingas) cut when the seed was ripe	110	118	7
21. Hibiscus, from the Cape of Good Hope (No. 18 of the former paper)	116	123	6
22. Hibiscus sabdariffa, cut when in flower, and steeped immediately	89	117	31
23. Hibiscus Abelmoschus, Kalee-Kustooree of the Hindoos, cut when in flower, and steeped immediately.	107	107	0
24. Hibiscus esculentus D'heroos of the Bengalese, cut when in seed, and steeped a few days after	79	95	20
25. Hibiscus bifurcatus, cut when in flower, and steeped immediately	89	92	3
26. Hibiscus pilosus, an annual, cut when in advanced flower, and steeped immediately	97	130	34
27. Theobroma guazuma, young tender shoots from the roots of small trees steeped immediately	100	140	40
28. Fibres of the foot-stalks of a very large new species of plantain, (Musa superba)	79	0	0

Remarks on some of the PLANTS *or* MATERIALS *mentioned in the annexed* TABLE.

No. 2. Jeetee, of the Rajemahl hill people, who make their bow-strings of it, which are said to last five years, though in constant use, and exposed to all sorts of weather. It is the fibre of the bark of a very extensive twining, shrubby, plant, a new species of Asclepias, discovered by my son, Mr. Wm. Roxburgh, in 1800, growing wild on the tops of the hills, in the vicinity of Rajemahl. The fibres are prepared by stripping off the bark from the tender, succulent shoots, during the rainy season, when they are full of sap; and by removing the pulpy parts with the nails, or with a piece of sharp edged hard stick, upon a board. Hitherto this beautiful, strong material, has been unknown to Europeans, and, so far as I have yet been able to learn, only employed by the people of those hilly or mountainous tracts, to make their bow-strings; consequently it will be difficult to ascertain the quantity that may be annually procured, or the price. All I can say at present is, that four pounds weight of the clean fibres, a friend procured for me, for one rupee (half-a-crown). A drawing and description of this beautiful and useful plant, is in the possession of the Honourable the Court of Directors, under the name of Asclepias Tenacissima.

No. 3. Calooee, or Battang-calooee, or Poolay of the Malays, a new, shrubby species of Urtica. The cord employed was made of fine sail-twine, sent from Bencoolen by Mr. Ewer, and was made by the Malays of that place. Its strength is very great, and the beauty and fineness of the fibre adds to its recommendation. But what quantity is procurable, or the price of it, I am at present unacquainted. The plant has, however, been introduced into the botanic-garden at Calcutta, where, in little more than one year, above one thousand plants were reared from four,

four, which were received from Mr. Ewer, the Governor of Bencoolen. I made a drawing and description, now in the possession of the Honourable the Court of Directors, of one of these plants, which flowered in November, 1804.

No. 4 to 9. The Sun, on which the experiments stated in the table were made, was sown between the 11th and 18th of June, 1801, and cut at 14 different ages, beginning on the 26th of July following, before the blossoms appeared, and ending the 14th of September, when the seed was fully ripe. The fibres of these different crops were prepared in different ways; viz. by macerating for a longer or shorter time; by steeping immediately after being cut; by being half-dried; or dried as well as the season would permit, as practised on the coast of Coromandel.

The average result of these various trials, will be found reduced to six numbers, in the table. But it is necessary to observe that the constant wet, or very damp weather, which prevails in Bengal at this season, renders it almost impossible to dry the plant, and must injure the quality of the fibre: indeed few seasons will admit of drying the plant to any extent. Various experiments, from half a day to half a year's drying, and keeping, were made with the view of ascertaining, whether steeping immediately after the plant was pulled, or at any other period, was the best for retaining the full strength of the fibre; and I have reason to believe, that immediate steeping is to be preferred, at least in Bengal, during the rains.

No. 10. This was a few square yards of Sun, reared from seed, which was received from Ganjam, on the coast of Coromandel; and though sown with the rest of the seeds in June, did not blossom till the close of the rains in October, nor ripened its seed till January. This sort I would call Winter Sun, because what is generally cultivated in Bengal, requires only about three months from the time of sowing (middle of June) for the ripening of the seed (September).

From the experiments made I am led to draw the following conclusions : viz.

1st. That the fibres of this material, are softer and finer when the seed is sown thick, and the plant cut as early as the flowering season, or rather before, and that they become coarser progressively, till the plant, which is annual, perishes.

2d. That the fibres are at their greatest strength, when the seed is ripe, which corresponds with the opinion of the natives. At this period the crop requires about one-third more time to complete the maceration, than if cut at the flowering season ; it may amount to, from 48 to 72 hours, according to the warmth of the water, and state of the weather. Deep water requires more time to complete the operation than shallow water, which is generally some degrees warmer.

3d. That the sooner the plant is committed to the water, after being cut, the better : probably, because during the rains it is very difficult to dry it, and on that account the strength of the fibre will be weakened and the colour injured. Besides in cleaning or dressing the Sun, by the usual modes practised in Europe for hemp, I found on an average, that the original quantity was reduced only one-third, when the plant was steeped immediately, and nearly one-half if kept with the view of drying it, before it is put into water.

4th. I found the practice of drying the plant, after maceration, and previously to the removal of the bark, as followed in Europe with hemp and flax, by no means advantageous, but prejudicial.

For an account of the plant Crotalaria juncea, which produces the Sun, and for the method of cultivating it on the coast of Coromandel, which is different from that in Bengal, consult the Coromandel Plants, Vol. II. No. 193.

No. 11, 12, 13. As a substitute for flax these seem to deserve attention, on account of the length, strength, and fineness

fineness of the fibre, and from the durability and strength of it, after 116 days maceration. The seed of No. 12 was brought from Canton in China, under the name of China Hemp, and grows as freely in Bengal, as the sorts in general cultivation there. But while the produce was fully as great, the quality was better, which induced me to distribute the seed among the natives, and recommend the cultivation of this sort in preference to No. 11 and 13.

No. 15 and 16. Abroma Augusta, of the Hortus Kewensis, called by the younger Linnæus Theobroma Augusta, in his Supplementum Plantarum; and Woollet Comal of the Bengalese. My remarks of the 31st of January, 1801, closed with an account of this plant. The Biggah there mentioned, or rather half Biggah (for by measurement it proved to be no more) yielded two luxuriant cuttings during the hot and rainy seasons; and a third of a more limited growth by the end of the cold season. For while the cool northerly wind prevails, during November, December, and January, the plant grows but little. The quantity of clean fibre obtained from the two first cuttings, weighed 245lb. avoirdupois; and from the third, 26lb. making together 271lb. which is a produce three times greater than the average produce of Sun from the same quantity of land. As the plants, though nearly two years old, are still luxuriant, I have reason to expect that their average produce will be for many years to come as great, if not greater, than it was last year. Another great advantage in favour of the Abroma Augusta is, that the Sun requires to be drest, for convenience of stowage, prior to its being shipped, by which it loses about one-third of its weight: the fibres of the Abroma Augusta are naturally clean and white, and do not, in my opinion, require dressing.

No. 17 and 18 is No. 16 of my former communication, and there called Hibiscus Maniho. It is, however, I am

now convinced, an undescribed species from the Moluccas, which I call H. Strictus, on account of the remarkable straightness of the stem and branches. Last year all the fibres of the few plants I then had, were only sufficient to make one line. The experiments on this beautiful material were, on that account, very limited. Nevertheless the seed collected from these few plants, produced plants sufficient to fill 40 square yards of land, and yielded 33 pounds weight of the naturally clean fibre from one cutting: and, as it is a short-lived annual, does not yield any second crop. A drawing and description of this plant is in possession of the Honourable the Court of Directors.

No. 19 and 20. Hibiscus cannabinus, an annual universally known over India, and in many parts cultivated, not only for the fibres of its bark, but also for its green leaves, which are of an agreeably acid flavour, not unlike sorrel, and used by the Hindoos as a pot-herb. For a drawing and description of the plant, consult Coromandel Plants, Vol. II. No. 190.

Ejoo, * No. 4 of my former memoir, in which it is observed, that this very valuable and beautiful tree is found to grow well in Bengal. Since that time I have attended particularly to its growth, and found that on an average, each tree produces about six leaves in the year, and that each leaf yields $10\frac{1}{2}$ ounces of ejoo (the black horse-hair-like fibres † employed for making cordage) which makes the annual produce of each tree within a fraction of four pounds ‡. Besides,

* Palma Indica venifera; and Rumph. Amb. vol. i. p. 57. t. 13. Arenga saccharifera of Labillardiere. Anou. Marsden's history of Sumatra, p. 77.

† The fibres grow from the base of the footstalks (stip.) of each leaf (frond.) and embrace completely the trunk of the tree. The fibres and leaves are easily removed without injuring the tree.

‡ Some of the very best trees I have found to produce fully one pound of the fibres in each leaf.

Besides, this palm abounds, probably, more than any other in wine, furnishing sugar and ardent spirits; and when the tree arrives at maturity, the pith of it is one of the varieties of sago meal, used by these people in their diet. Hence we have every reason to think, that it will prove one of the most profitable trees which can be cultivated in warm countries, at least in those where it will grow freely.

I had various other plants in cultivation for further experiments, when bad health obliged me to desist and come to England. From the following I had prepared the fibres, but had not made any experiments on their strength.

Agave Tuberosa of the Hortus Kewensis. The large leaves of this elegant species, which has lately been introduced into Bengal, are replete with strong white fibres, far superior in appearance to those of Agave Americana (No. 11 of my first paper).

Musæ. The plantain in its wild state abounds in strong fibres, more or less fine. The species which we call Coccinea, yields what is called Manilla hemp: at least it was sent to me from China as that plant.

Helicteris Isora. The inhabitants of the Malabar mountains, employ this material for making twine and cordage. In Wynaad they call it Ky-walla-nara. It is strong, but rather coarse, and of a dull colour. Various species of Sida, particularly Rhombifolia, and Periplocifolia, yield uncommonly fine fibres. In Rhombifolia they are particularly delicate. Urenalobata and Sinuata also abound with them. In short, the whole of the plants of this extensive natural order, called by Linnæus, Columniferæ, and by Jussieu, Malvaceæ, are furnished with substitutes for hemp and flax.

P. S. Samples of most of the materials mentioned in this paper, I have in my possession, and it is my intention to deposit them in the East India Company's Museum in Leadenhall-Street.

DEAR SIR,

I WISH the above Paper may prove acceptable to the Society of Arts, &c. I also send to you a Table of the growth of trees in the Botanic Garden at Calcutta; the average circumference of several of each sort of trees mentioned in the list, in inches and quarters, were taken $4\frac{1}{2}$ feet above the ground, at the end of October, when the year's growth may be reckoned over. The difference between the numbers in the adjoining columns, gives one year's increase in the circumference of each sort.

I am, with much regard,

Dear Sir,

Your most obedient Servant,

W. ROXBURGH.

No. 5, Prospect-Place, Chelsea,
March 19th, 1806.

To Dr. C. TAYLOR.

ON THE GROWTH OF TREES IN THE BOTANIC GARDEN AT CALCUTTA IN BENGAL.

(*To face Page* 154.)

Names of the Trees.	Synonymas.	Years age of the Trees measured in 1803 and 1804.																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Tectona grandis	Teak, E. Sagoon, H.	—	7	10½	—	—	—	—	18¼	21¼	—	—	—	—	—	42½	44¼			
* Swietenia Mahogani	Mahogany, E.	—	—	—	—	—	25½	30¼												
Swietenia chickrassa	Chickrassy, H.	—	—	—	—	—	—	—	25	28										
Swietenia febrifuga	Soymida, T. Roheena, H.	—	—	—	—	—	—	—	21½	24½										
Terminalia alata-tomentosa	Asseen	—	—	—	—	—	—	—	—	—	—	—	—	—	37	38				
Terminalia bialata		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	51	53½	
Terminalia catappa	Buddam	—	—	—	—	—	—	—	—	30	32½									
Terminalia procera		—	—	—	—	—	—	—	23	25										
Terminalia belerica	Beheyrah, H	—	—	—	—	—	—	—	—	20	23¼									
† Dalbergia sissoo	Sissoo, H.	5	11½	14¼	17½	—	—	—	—	—	—	—	—	—	—	—	—	—	70	75
Dalbergia ougienensis		—	—	—	—	—	12½	14¼												
‡ Dalbergia emarginata		—	—	—	—	—	—	—	—	—	—	—	—	25½	30					
Pterocarpus marsupium	Yeangashaw, T.	—	—	—	—	—	—	—	—	—	—	23	26							
Pterocarpus Dalbergioides	Andaman, red-wood	—	—	—	—	—	—	—	—	27	29½									
Cedrela toona	Toon, or Tooni, H.	—	—	—	—	—	—	—	—	—	—	32¼	35	—	42					
Mimosa seereesa	Seerees, H.	—	—	—	—	—	—	29	31½											
Mimosa Xylocarpa	Conda-tangheroo, T.	—	—	—	—	—	17	21												
Mimosa elata		—	—	—	—	—	—	—	—	28	30½									
Mimosa stipulacea	Amlooki	—	—	—	—	—	—	40	48½											
Mimosa lucida		—	—	—	—	—	—	—	—	—	—	49	56½							
Pterospermum paniculatum	Mows-jāl, H.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	21½	24½			
Aleuritis triloba		—	—	—	—	—	28½	31												
Nauclea stipulacea		—	—	—	11	13½														
Nauclea necotianifolia		8	15¾																	
Uvaria odorata		—	—	—	14	19														
Casuarina muricata, in garden mould		—	—	—	20	22														
The same in a very sandy soil		—	—	—	26½															
Cassia Sumatrana		17½	23½																	
Butea frondosa	Palas, H.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40	43
Lagerstromia Reginæ	Jaral, or Jarool, H.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48½	53
Gmelinia arborea	Gumār, or Gumhar, H.	—	—	18½																
Melia azedarach		—	—	—	—	37½														
Bignonia suberosa		—	—	—	—	—	—	—	—	—	36	39¼								
Sterculia villosa		—	—	—	—	—	—	25	27½											
Andersonia altissima	Siri-Maun, T.	—	—	—	12½	15½														
Myristica aromatica	Nutmeg	—	—	—	—	3½	4½	Two and a half feet above the ground.												

* Two Plants (and the first) were sent by the Honourable the Court of Directors, to the Botanic Garden at Calcutta, in 1795; and by the end of 1804, above 500 plants had been reared from these two. It succeeds so perfectly well in the East Indies, that the tree will, without doubt, in a few years, prove a valuable acquisition to that country.

† An immense tree of very quick growth. It supplies the ship-builders at Calcutta, with all the knee, and other crooked timber, It is strong, but not very durable.

‡ This promises to be more durable than Sissoo. It is a native of the Andaman Islands. As yet, the trees on the continent of India are small, and but few in number.

Note. In the column of Synonymas, H. means Hindoostanee, T. Telinga, and E. English.

The SPECIMENS *noted in the following* LETTER *are placed in the Society's Repository.*

DEAR SIR,

I THINK it more than probable that the Society of Arts, &c. do not possess any specimen of the vegetable fibres, commonly called Ejoo in the East Indies. I have, therefore, the pleasure of sending you a parcel of that substance, consisting of six small rolls, the produce of a small tree for one year. The tree produces, on an average, six leaves every year, and each leaf yields from about four to twenty ounces. It is No. 4. of my first paper on the comparative strength of various vegetable fibres, published in the xxii. vol. of the Society's Transactions. A description of the tree has lately been published by Labillardiere, under the name of *Arenga Saccharifera*. It is the *Anou* of Marsden in his History of Sumatra, page 77: in Rumphius's Herbarium Amboynense, vol. i. page 57, and table 13. a very full account of this valuable palm will be found. By Loureiro, in his Flora Cochinchinensis, p. 759, it is called Borasus Gomutus. The cultivation of this beautiful, stately, and very useful palm may, I think, with the prospect of great advantage, be encouraged in the West Indies. For, besides the above-mentioned fibres, which are in high estimation for thick cordage and cables in India, this palm furnishes sugar, and abounds, as before mentioned, probably more than any other, in wine, which, in its recent state, is a pleasant and wholesome beverage, and is also converted by the Malays into ardent spirits; and when the tree arrives at maturity, the pith of it is one of the varieties of sago meal used by these people in their diet.

I have the pleasure also of sending you a specimen of a most curious, light, vegetable substance, the spreading

stems of *Acschynomene Aspera*, a water plant, called by the Hindoos and Bengalese *Solah*, and *Fool-Solah*. It is employed by them for a variety of purposes, such as floats for fishing nets, artificial flowers, &c. Might it not be advantageously employed instead of cork, in making jackets to swim with, and in life-boats, &c.? At all events, the bare circumstance of making known the existence of such a plant, and the place in which it flourishes, will, I am persuaded, be acceptable information to the Society.

I am, Dear Sir,

Yonr most obedient humble Servant,

W. ROXBURGH.

No. 5, Prospect-Place, Chelsea,
April 5, 1806.

To Dr. C. TAYLOR.

The SILVER MEDAL *of the Society was this Session voted to* Mr. PHILEMON WRIGHT, *County of York, Lower Canada, for the* CULTURE *of* HEMP *in that Province.*

The following Communications were received from him, and Samples of the Hemp and Seed are preserved in the Society's Repository.

SIR,

THIS is to certify, that Mr. Philemon Wright, of the township of Hull, in the district of Montreal, and province of Lower Canada, did, in the month of November last past, prefer a memorial and representation to the honourable Thomas Dunn, president of the said province, and administrator of the government thereof, containing in substance as follows.

That

That the memorialist did sow and cultivate 10 English statute acres of hemp, annually, during the years 1802, 1803, and 1804.

That owing to the great drought which prevailed in 1804, the crop was unproductive, reducing the medium produce of the three years to about 600 weight of clean drest hemp of the first quality per acre.

That all the hemp sown in Hull was by the broad-cast method, at the rate of three bushels per acre. (The land, which was of a rich grey loom, was previously ploughed thrice, and harrowed, and again harrowed after the seed had been sown.)

That he commenced pulling the male hemp on or about the first of September, laid it in rows to dry, and when it had received one day's sun, turned the rows over with a short pole, and suffered them to remain until they became thoroughly dry; that he gathered them up in fair weather, and bound them with willow withs into small bundles of two feet and a half in circumference, and then piled them into stacks of 500 bundles each, covering them with straw, or otherwise, to protect them from rain.

That the process of maceration was performed in stagnant pools of water, of about three feet in depth, where the bundles were sunk in regular rows, by means of poles laden with stones, to at least two inches below the surface of the water, and there suffered to remain from seven to nine days, if during the middle of September; but when so late as the middle of October, from 16 to 18 days: the number of days, however, depending on the temperature of the water. That when the hemp peeled and separated easily from the stalk or pith from end to end, it was taken out of the water, and laid to drain a day or two, then removed to a fit place, unbound, and spread out thinly, that it might dry thoroughly; after which it was bundled again, and housed or stacked as before, until leisure admitted the breaking

breaking or dressing of it. That if the bottom of the pool were muddy, poles were laid under the hemp, to prevent its coming in contact with the mud; but if gravel or sand formed the bottom, this precaution was unnecessary.

That the memorialist practised another process after maceration, which has been attended with good effect, and a great saving of manual labour, viz. after the water is drained from the hemp, open the bottom of the bundle by raising the band or withy, then set it up against paling or rails, and there let it remain until the month of April, when it will dress much easier; for the action of the frost and air destroys the glutinous matter, which is the greatest obstacle in dressing, and thus facilitates the separation of the hemp from the pith or woody substance.

That hemp macerated late in the season is tough and hard to break or dress, in consequence of its not being sufficiently dried, and is attended with great waste,

That the memorialist, by keeping such hemp until the second winter, experienced that a man would dress double the quantity of it, in the same time, that he could the preceding year.

That in dressing by hand, three heavy breaks were used in succession, the first bearing two grooves, the next four, and the third the same number, but more compact.

That the female plant, or that bearing seed, was suffered to stand until fully ripe, usually the first week in October, when it was cut down, suffered to lie two days in fair weather, then turned, and when sufficiently dry, threshed with an ordinary flail upon cloths, or on a trodden level space upon the field, winnowed, and housed as speedily as possible. That this hemp was afterwards treated in the same manner as the male hemp, though its produce is much inferior both in quantity and quality.

That there being no other labourers to resort to than the immediate settlers upon the township, the price of labour

is

is extravagantly high: a bushel of wheat or a dollar is the lowest rate for daily hire per man. That this price, together with victualling, made the medium expense attendant on the cultivation of a statute acre of hemp in the township of Hull, from first to last, to amount to 10*l.* currency. That this scarcity of labourers arises from the township being 80 miles from the last settlements in the province upon the Ottawa, or Grand River, and from the infancy of its establishment, which commenced within these five years.

That it appears, by the Certificate of the Secretary to the hemp committee, at Montreal, that more than three quarters of the hemp produced in that district, and purchased by the committee between the first of May 1802, and the first of August 1805, was raised in the township of Hull, where a considerable quantity was also manufactured in three looms and six rope-walks, set up and worked by the inhabitants for their own use.

And I do further certify that the foregoing particulars regarding the culture of hemp in the township of Hull, by Mr. P. Wright, during the three successive years, as set forth in his memorial, are supported by regular affidavits of persons residing on the spot, to the satisfaction of the executive government of this province.

Witness my hand at Quebec, this 22d day of January, 1806,

HERMAN W. RYLAND,
Clerk of the Executive Council of Lower Canada.

To C. Taylor, M. D.

The Society received a Certificate from the honourable T. Dunn, president of the province of Lower Canada, stating that Herman Witsius Ryland, Esq. is clerk of his Majesty's executive council for the province of Lower Canada.

Mr.

Mr. FREDERIC ARNOLD, *of the River Thames, Upper Canada, and* Mr. JOSHUA CORNWALL, *of the same Place, were each presented with a* SILVER MEDAL *from the Society, for the* CULTURE *of* HEMP *in Canada.*

The following Communications were received from them, and Samples of the Hemp and Seed are preserved in the Society's Repository.

EXPENSE of cultivating 11 acres and eight perches of hemp, three feet apart, by Mr. Joshua Cornwall, of the River Thames, Upper Canada.

		£.	s.	d.
1802. June.	7 days ploughing	5	16	0
	Drilling and harrowing	3	0	0
	Half a bushel of seed	1	4	0
August.	7 days pulling-out the summer-hemp	2	16	0
October.	9½ days cutting the seed	3	16	0
November.	21 days gathering, threshing and cleaning the seed	8	8	0
		£.25	0	0

Expense of cultivating 12 acres, 2 quarters, and 30 perches of hemp, 18 inches apart, by Frederick Arnold, of Howard, River Thames, Upper Canada, commencing the first day of May, 1802.

	£.	s.	d.
9 days ploughing with a man and horses	7	4	0
3 days harrowing	2	8	0
3 men and team, for four days drilling	6	0	0
3 men for 5½ days weeding, and pulling-out the summer hemp	6	12	0
1 man eleven days cutting the seed-hemp	4	8	0
A pair of horses and one man hawling the hemp for 4 days	3	4	0
Thrashing and cleaning the seed	7	4	0
	£.37	0	0

Certificates,

Certificates, with respect to the two preceding lots, have been transmitted to the Society from A. IREDELL, Esq. stating the quantity of land cultivated with hemp, and the distance of the plants from each other.

From Mr. WILLIAM SHAW, and Mr. LEMUEL SHERMAN, stating that they measured 80 bushels of hemp seed, in 1803, raised on the above lot by JOSEPH CORNWALL.

From Mr. GEORGE REYNOLDS, who had seen 146 bushels of hemp-seed measured, which, to his knowledge, had been raised on the above lot by Mr. FREDERIC ARNOLD; sworn before W. SHAW.

From Mr. WILLIAM SHAW, stating that Messrs. J. CORNWALL and F. ARNOLD, had sworn before him, that the two accounts of expence above inserted, and given in by them respectively, are, to the best of their knowledge, true.

And from P. HUNTER, Esq. Lieutenant-governor of the province of Upper Canada, stating that WILLIAM SHAW and ABRAHAM IREDELL, Esq. are two of his Majesty's justices of the peace for that province.

To Dr. C. TAYLOR.

TWENTY DOLLARS *were this Session adjudged to* Mr. GEORGE WARD, *of the Township of Camden, Upper Canada, for the* CULTURE *of* HEMP *in that Province.*

The following Communication was received from him, and Samples of the Hemp and Seed are preserved in the Society's Repository.

SIR,

I BEG leave to transmit through your hands to the Society of Arts, &c. vouchers in favour of George Ward, a farmer, living

living near this part of the country; as also a certificate from his honour Alexander Grant, president of the government, stating, that Abraham Iredell, and James Baly, are two of his majesty's justices of the peace for that district.

I forward to you, at the same time, a bundle containing two quarts of hemp seed, and 28lbs. of hemp, as samples.

I have the honour to be,
Sir,
Your most obedient humble Servant,
W. ALLAN.

Camden, May 12, 1803.

Account of expense in cultivating two acres and eight square chains of good new land for drilled hemp.

		£.	s.	d.
May 12.	Ploughing, a man and team, at 16*s.* per day .	4	0	0
	Harrowing, 16*s.* per day	1	2	0
	Furrowing with a man and horse -	0	13	0
	Sowing seed in furrows, at 18 inches apart, 2 men at 4*s.* per day each . - . . . . -	0	8	0
	Harrowing (same day)	0	16	0
June 27.	Ploughing between the drills to destroy the weeds	0	9	0
	Hoeing ; men at 4*s.* per day each	2	0	0
Oct. 16.	Cutting ; men at do.	1	4	0
	Carrying	1	12	0
	Threshing ; men at 6*s.* per day each	1	4	0
	Cleaning seed ; men at 4*s.* per day each . .	0	8	0
	1 man attending to stir and air the seed . . .	0	4	0
		£. 14	5	0

N. B. No charge is made for men's provisions.

G. WARD.

The

The vouchers in possession of the Society are from J. BALY, Esq. before whom the account of expenses incurred was attested; from A. IREDELL, Esq. Surveyor, who measured the land; and from the president, ALEX. GRANT, Esq. who testifies that J. BALY, Esq. and A. IREDELL, Esq. are both his Majesty's Justices of the peace in and for the western district of Upper Canada.

To Dr. C. TAYLOR.

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No.

C. A MODEL of a Weed-Harrow, by J. C. Curwen, Esq. See page 35.

CI. Specimens of Fir Timber, to show the Effects of good or bad Pruning of Fir Trees, by Mr. R. Salmon. See page 68.

CHEMISTRY, &c. CLASS II.

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MANU-

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XLII. A Model of a Loom, to be worked by Steam or Water, by Mr. J. Austin. See page 93.

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No.

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Polite Arts. Class V.

I. Pannels for Painting upon, and Specimens of Colours and Oil, prepared by Mr. Sebastian Grandi. See page 85.

II. A Portrait of the late James Barry, Esq. painted at Rome by Monsieur G. L. Blanchell, a French Artist, and presented by Wm. Moffat, Esq. of Fenchurch-Buildings. See page 168.

III. A Model of a new Medal for the Society, by J. Flaxman, Esq. R. A. See page 167.

Colonies and Trade. Class VI.

I. Specimens and Samples of various Products of the East-Indies, by Dr. Wm. Roxburgh. See page 155.

II. Specimens of Canada-Hemp and Seed, by Mr. Philemon Wright. See page 156.

III. Spe-

No.

III. Specimens of Canada-Hemp and Seed, by Messrs. F. Arnold and J. Cornwall. See page 160.

IV. Specimens of Canada-Hemp and Seed, by Mr. G. Ward. See page 161.

A LIST

A LIST

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AND

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P Zenobio,

Z

P Zenobio, Right Honourable Count Alvise

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